Title page

Restraint use in residents with dementia living in residential aged care facilities: a scoping review

Running title: Restraint use in dementia residents

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Abstract

Aims and objectives: To provide an overview of restraint use in residents with dementia in the context of residential aged care facilities.

Background: Restraints are commonly used in people with dementia living in residential aged care facilities to manage behaviours and reduce injuries, but the concept of restraint use in people with dementia remains ambiguous, and current practices to reduce restraint use in long-term care residents with dementia remains unclear.

Design: A scoping review using the methodological frameworks of Arskey and O'Malley and colleagues.

Methods: Nine databases (CINAHL, MEDLINE, EMBASE, PubMed, Scopus, Web of Science, OVID, Cochrane Central Register of Controlled Trials, and ProQuest) were searched from 2005 to May 20, 2019. Articles were included if they were written in English, peer-reviewed and used any research method that described restraint use in residents with dementia living in residential care settings. The PRISMA- ScR checklist was used.

Results: From 1585 articles, 23 met the inclusion criteria. There is a lack of a clear definition of restraint use and the prevalence of restraint use varied from 30.7% to 64.8% depending on the different operational concepts. People with dementia were at a higher risk for restraint use and the decision-making process for restraint use were largely ignored in the literature. The effect of staff educational interventions to reduce restraint use was inconsistent due to varying delivery duration and content.

Conclusions: The prevalence of restraint use in people with dementia living in residential care settings remains high alongside the absence of a clear definition of restraint use. More research about the decision-making process involved in using restraint and development of

effective interventions are needed.

Relevance to clinical practice: Better education about the decision-making regarding staff, conditions of residents and organisations for restraint use is needed to improve the care for people with dementia living in care settings.

Keywords: Dementia; Long term care; Restraint; Scoping review

What does this paper contribute to the wider global clinical community?

- The prevalence of restraint use in people with dementia living in residential aged care facilities remains high despite the absence of a clear definition of restraint use.
- Restraint use in people with dementia is a complex process, and the decision-making process and person-centred care need to be incorporated into the training of staff.
- The effectiveness of educational interventions to reduce restraint use remains unclear in particular the heterogeneity of duration, content/structure and staff involvement.

1. Introduction

There is an increasing number of people diagnosed with dementia, with over half of those living in residential aged care facilities (RACFs) cognitively impaired with high care needs (Dementia Australia, 2019). People with lower cognitive function and higher care dependency are more likely to be restrained (Freeman et al., 2017; Huang et al., 2014). A restraint is a device or medication that is used to restrict a person's voluntary movement (Agens, 2010). Specifically, physical restraint has been internationally defined as "any action or procedure that prevents a person's free body movement to a position of choice and/or normal access to his/her body by the use of any method, attached or adjacent to a person's body that he/she cannot control or remove easily" (Bleijlevens et al., 2016, p. 2309). Whereas, chemical restraint is "the intentional sedation or control of an individual's behaviour through the use of medicines (Peisah & Skladzien, 2014).

The prevalence of restraint use in people with dementia is around 31% in Europe (Hamers, 2017) and it ranges from 6% in Switzerland to 31% in Canada (Feng et al., 2009). Restraint use has been consistently associated with an increase in falls, injury and even death (Barnett et al., 2012; Karger et al., 2008; Rakhmatullina et al., 2013). Despite these negative consequences, restraint has been used as a "common practice" in RACFs under the premise of risk minimisation and prevention of harm to self or others (Wang & Moyle, 2005), in

particular for people with dementia with challenging behaviours (Hamers, 2017). However, restraint removal did not lead to increased injuries in residents (Tilly & Reed, 2008). With the promotion of a 'restraint-free' model of residential aged-care (Australia Medical Association, 2015), the use of restraint is considered as an indicator of poor quality of care (Konetzka et al., 2014).

There is a growing number of review papers on staff educational interventions for restraint use in RACFs (Lan et al., 2017; Möhler et al., 2012), care staff perceptions towards restraint use (Kong et al., 2017), and restraint use in older adults in home care (Scheepmans et al., 2018). However, these reviews, apart from a review published in 2005 (Wang & Moyle, 2005) have ignored people with dementia living in RACFs, who are reported to experience a higher incidence of restraint use than those without dementia (Hofmann & Hahn, 2014). In the context of RACFs, the use of restraint is influenced by lack of education, safety concerns and characteristics of staff (Willemse et al., 2016) and residents (Hofmann & Hahn, 2014). The primary aim of this review was explicitly proposed to research restraint use in people with dementia living in RACFs since 2005. We aimed to report on the current knowledge, characteristics and concepts of restraint use. In this case, a scoping review was considered as the better choice of review method, in particular, to clarify definitions of restraint use.

2. Methods

This scoping review was conducted following the six-stage methodological framework described by Arksey and O'Malley (2005) and Levac and colleagues (Levac et al., 2010). We conducted a comprehensive search on the literature following the PRISMA guidelines (PRISMA Extension for Scoping Reviews, PRISMA- ScR, FileS1) (Tricco et al., 2018). The objective of the review was to map the available evidence to provide an overview of restraint use in residents with dementia in the context of RACFs.

2.1 Identifying the research question

The research questions guiding this scoping review included: (1) What is the definition, prevalence, type, frequency of restraint use? (2) What is the reason, risk factors, decision-making process and adverse events for restraint use? (3) What interventions were used to reduce restraint use in residents with dementia living in RACFs?

2.2 Identifying relevant studies

The literature search strategy and keywords were developed with assistance from the University Health Librarian. Both the medical subject headings (MeSH) and text words related to PCC elements (Population, Concept and Context) (Peters et al., 2017) were used to form the search terms. The databases included CINAHL, MEDLINE, EMBASE, PubMed,

Scopus, Web of Science, OVID (Psych Info), Cochrane Central Register of Controlled Trials (CENTRAL) and ProQuest. The search terms were tailored to each database to address the differences in thesaurus terminology and indexing (Table 1). Further searches were performed on reference lists of included studies and relevant systematic reviews. The literature search was limited to the English language; published as a full-text article in a peer-reviewed journal; primary research using any research method and published from 2005 up to May 20, 2019, were selected. The 2005 date was chosen because a similar review paper was published in 2005 (Wang & Moyle, 2005). The search history is presented in AppendixS1.

2.3 Study selection

Two authors independently screened the title and abstract of searched citations to discard any irrelevant articles before assessing the eligibility of full-text studies. Regular monthly meetings occurred between the research team for solving disagreements to ensure rigour within the study selection process. As scoping reviews have a broader “scope” with correspondingly less restrictive inclusion criteria (Peters et al., 2017), the following inclusion criteria were based upon the Population, Concept and Context (PCC) elements. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines were employed to promote consistency, accountability, integrity, and transparency in the conduct of this review (Tricco et al., 2018)(AppendixS2).

2.3.1 Population

Study participants were older adults (≥ 65 years of age) with dementia. Studies not exclusively focused on residents with dementia but with separate data reporting on restraint use in people with dementia were included.

2.3.2 Concept

Any empirical research on restraint use of any study design was included. These studies may report a definition of restraint, data on prevalence, types of restraint use, frequency, reasons, risk factors, the decision-making process for use, and adverse events of restraint use as well as interventions to reduce restraint use in people with dementia.

2.3.3 Context

The context of this review was RACFs, where people with dementia live, including nursing homes, long-term care facilities, residential homes/facilities were included while other settings such as hospitals or homes, were excluded.

2.4 Data charting and item extraction

After removal of duplicates and discussion between authors, the key findings were focused on results relevant to the study objectives. A standardised data extraction form was developed

collect following details of included studies: study record (year of publication, study location), research design, study population, study aim, study method, outcome measures and findings (AppendixS3). The data was initially extracted by one author (LP) before being reviewed and independently interrogated by another author (WM). A final check was performed by both authors to maintain rigour and authenticity.

2.5 Collating, summarising and reporting the results

Results were reported as a narrative summary focusing on the objective that guided this scoping review. Included articles were grouped by study design including qualitative studies, observational studies, quasi-experimental studies and randomised controlled trials. The different outcomes on restraint use guided the reporting of the results, including (a) definition; (b) prevalence; (c) type; (d) frequency; (e) reason; (f) risk factors, (g) decision-making process; (h) adverse events; and (i) interventions to reduce restraint use in residents with dementia living in RACFs.

2.6 Consulting with stakeholders

Stakeholder consultation is an optional stage, and this was not conducted in this scoping review.

3. Results

3.1 Results of the search

Overall, 591 references were identified from nine databases after removing duplicates including six articles retrieved from reference lists of the included studies and relevant systematic reviews. After title and abstract screening, 45 articles were left for full-text reading. Furthermore, 22 articles were excluded due to there being people without dementia (n=15) and outcomes without restraint use (n=7). Finally, 23 articles were included in this scoping review. The PRISMA flowchart of study selection is presented in Figure 1.

3.2 Description of included studies

Table 2 outlines the characteristics of the included studies and participants. Among 23 included studies, we identified one qualitative study, 12 observational studies, three quasi-experimental studies and seven randomised controlled trials (RCTs). These studies were conducted in different countries, including the USA (n=6), Norway (n=5), the Netherlands (n=4), Germany (n=2), Canada (n=2), Singapore (n=1), Taiwan (n=1), Sweden (n=1) and one study were conducted from multiple European countries. Included studies were published between the years 2005 and 2017. Eighteen studies included residents with mild to severe cognitive impairment and five studies (Allen et al., 2005; Cassie & Cassie, 2013; Freeman et al., 2017; Mamun & Lim, 2005; Selbaek et al., 2016) reported separate data on restraint use

in residents with dementia. Moreover, fifteen studies documented the presence of behavioural and psychological symptoms of dementia (BPSD) in participants. Table 3 presents a descriptive summary of included studies that align with the objective of the scoping review.

3.2.1 The definition, prevalence, type and frequency of restraint use

The definition of restraint varied across studies but was usually defined in terms of doing something to limit movement. Outcomes from all studies included physical restraint (n=23) of any device to limit residents' mobility (e.g., bed rail, belt, deep chair, trunk/limb restraints, etc) while six studies also included electronic surveillance, such as infrared systems, as an indicator of restraint. The prevalence of restraint use in people with dementia living in RACFs varied from 30.7% (Selbaek et al., 2016) to 64.8% (Mamun & Lim, 2005). Different types of restraint use were recorded and the most commonly used was the use of chairs (Luo et al., 2010) or bedrails (Kuske et al., 2009). Only one study reported the frequency of restraint use with a mean of 1.59 times a day (Huizing et al., 2006).

3.2.2 The reason, risk factors, decision-making process and adverse events of restraint use

The reason for restraint use was poorly reported. Only one study mentioned that residents were restrained to prevent dislodgement of feeding tubes, to prevent falls and restrained for agitation (Mamun & Lim, 2005). Black residents (Cassie & Cassie, 2013), residents with antipsychotic medication (Foebel et al., 2016), residents with high activities of daily living (ADL) dependency (Te Boekhorst et al., 2013) and dementia (Freeman et al., 2017; Luo et al., 2011; Mamun & Lim, 2005) were more likely to be physically restrained. Furthermore, Konetzka et al. (2014) found that an increase in antipsychotic use (chemical restraint) was related to a decline in physical restraint use. Residents with dementia living in special care units (SCU) were less likely to have bed rails than those in regular units without an SCU (Luo et al., 2010). Ethnographic observations of 5~10 hours/day in three nursing homes indicated that decisions about the use of restraint were related to residents' characteristics such as agitation, aggressiveness and wandering as well as organisational factors, such as resident mix, staff culture, location and human resources (Øye et al., 2017). Reported adverse events related to restraint use included ADL decline (Foebel et al., 2016), cognitive decline (Foebel et al., 2016; Freeman et al., 2017; Te Boekhorst et al., 2013), higher occurrence of agitated behaviours (Lin et al., 2009), higher risks for falls and fractures (Luo et al., 2011), mortality risk (Allen et al., 2005; Selbaek et al., 2016), and restraint increased the odds of delirium by 464% (Voyer et al., 2011).

3.2.3 The interventions and outcomes for restraint use

Three types of interventions were reported to reduce restraint use in people with dementia

living in RACFs: (i) Nonpharmacological recreation therapy (n=1): A positive effect on restraint reduction was found for a pre-post study of the Closing Group project, which was an interdisciplinary small group therapeutic activity to decrease restraint use in 16 long-term care residents with severe dementia (Putman & Wang, 2007); (ii) Facility environment design (n=2): Significantly fewer physical restraints were used in people living in group living homes (te Boekhorst et al., 2009) or small-scale living facilities (Verbeek et al., 2014) compared with traditional wards; and (iii) Staff educational interventions (n=7): Five RCTs found staff educational interventions significantly reduced restraint use in the intervention group compared to the control group (Koczy et al., 2011; Kuske et al., 2009; Testad et al., 2005; Testad et al., 2010). One study reported no significant differences were found in two studies (Huizing et al., 2006) and another study reported a higher reduction of restraint use in the control group (Testad et al., 2016).

The duration of interventions varied from two to seven months. The content of the education aimed to improve the knowledge of staff regarding dementia care, the reasons, adverse effects, and alternatives towards restraint use. Four studies included the decision-making process of restraint use (Huizing et al., 2006; Koczy et al., 2011; Testad et al., 2005; Testad et al., 2016). Only one study incorporated person-centred care in staff training (Testad et al., 2016). Four studies provided educational interventions for all care staff (Kuske et al., 2009; Testad et al., 2005; Testad et al., 2010; Testad et al., 2016) while three studies primarily focused on nursing staff (Huizing et al., 2006; Koczy et al., 2011; Pellfolk et al., 2010). Two studies provided education followed by monthly sessions of guidance to reinforce skills of staff (Testad et al., 2005; Testad et al., 2010), and two studies provided education in combination of either consultation of a nurse specialist (Huizing et al., 2006) or case consultations (Koczy et al., 2011).

4. Discussion

This scoping review provides an overview of the available evidence of restraint use in residents with dementia living in RACFs. There is a lack of a clear definition of restraint use in the available literature, making it difficult to compare the results of different types of restraint or to suggest alternatives. The prevalence of restraint use varied from 30.7% to 64.8% depending on the different operational concepts of restraint use and this suggests there is a notable gap in evidence-based practice in the reduction or alternatives to restraint use. The use of chairs and bedrails was reported to be the most common types of restraint use, but the reason and decision-making process for these types of restraints were largely ignored in the literature. Once again suggesting that although restraint is commonly used, nursing practices

have not translated into practice using person-centred approaches where people with dementia display behavioural problems. People with dementia were reported as being more likely to be physically restrained (Hofmann & Hahn, 2014), which may lead to further functional and cognitive decline (Freeman et al., 2017), delirium (Voyer et al., 2011) and even death (Selbaek et al., 2016).

Interventions using relaxation and environment modification may have the potential to reduce restraint use, but the available evidence was based on quasi-experimental studies rather than RCTs, and this may have prevented their use in practice. The effect of educational interventions to reduce restraint use in people with dementia living in RACFs was inconsistent due to the varying delivery duration, content/structure and the requirements for staff, meaning that where there is limited staff, it is likely that restraint will be used.

4.1 Relevance to research, clinical practice and policy

Definitions of restraint use in residential aged care vary widely, ranging from very narrow definitions that incorporate a few physical methods, such as belts or chairs with fixed tables to hinder movement, to broader definitions that include a wide range of physical, pharmacological (e.g., the use of antipsychotic medications) and/or environmental restraint (e.g., the use of surveillance systems) (Peisah & Skladzien, 2014). Consensus recommendations on the definition of restraint use may add value to the practice by making the measurement of restraint use more applicable for care staff and help to guide the practice and policy of restraint use in RACFs.

People with dementia living in RACFs are more likely to be restrained due to their display of aggressive behaviours and staff may use restraint during care activities, such as showering or bathing to protect themselves from being hurt by the resident (Øye et al., 2017). However, this may further agitate the resident and increase the risk of injuries. Significant evidence has demonstrated that ensuring an adequate number of registered nurses relative to the number of unregulated care assistants may reduce restraint use in RACFs (Wagner et al., 2013) and offer improvement in the general quality of aged care (Henderson et al., 2017). Additionally, evidence shows that residents living in dementia special care units with specialised practice nurses may experience less restraint (te Boekhorst et al., 2009; Verbeek et al., 2014). Frequently, if staff used a person-centred approach where they learnt the resident's needs and responded to those needs, it is likely that there would also be less use of restraint. Therefore, an adequate staff ratio and sound knowledge and respectable attitudes towards restraint use are essential to improve the practice of restraint use in people with dementia living in RACFs.

Care staff often find it difficult to decide whether it is ethical and appropriate to restrain residents with challenging behaviours (Kong et al., 2017). Decision-making is a complex trajectory which depends on resident characteristics, staff-related factors and contextual factors (Goethals et al., 2012). Therefore, facilities should build guidelines for restraint use to promote alternative approaches to manage challenging behaviours of dementia. The use of restraint should only occur in extremely limited circumstances and the reasons for restraint use should be clearly documented, including duration of use, regular monitoring of the outcome of restraint use and any adverse events (Bellenger et al., 2019). A guideline-based multicomponent intervention was reported to significantly reduce physical restraint use in nursing homes (Kopke et al., 2012) but its effect on residents with dementia was unclear. Additionally, the implementation of risk management practices, a formal method of balancing the probable consequences of decisions, and validating clinical decision-making processes (Clarke & Mantle, 2016), is also essential to promote person-centred dementia care. Furthermore, care staff must be trained and instructed in this process to balance ethical and safety values.

The issue of restraint has been attended to in many countries by introducing regulatory approaches to the use of restraints, especially where a person lacks the capacity to give informed consent. For example, in Australia the Quality of Care Principles (Australia Government, 2019) require care providers to ensure assessment is carried out by approved persons and alternative approaches are tried and documented before physical or chemical restraint is used. In Norway, the use of restraint can only be used as a last resort (Jacobsen et al. 2009). However, despite such regulations, restraint continues to be used often because staff are not aware of alternatives (Testad et al., 2016).

Most of the interventions to reduce restraint have focused on staff education. However, it is argued that many of these education interventions do not work as they are not person-centred, do not build confidence in alternatives to restraint (Testad et al., 2016), and the importance of the facilitator's role has not been understood and integrated into the education intervention (Hardiman & Dewing, 2014; van Lieshout & Cardiff, 2015). In terms of future research interventions, an RCT design is necessary so that effects can be compared. Also, studies should seek to collect, and report outcomes of restraint use from residents, staff and families as we need to understand the implications of its use for all participants involved directly and indirectly. Further research exploring the environment and staff factors that can impact on the use of restraints may help to understand and reduce the use of restraint.

The development of interventions for people with dementia who are at high risk of

being restrained is essential to reduce unnecessary restraint. However, fluctuations in the condition of older people with dementia do not make assessment and reduction of restraint easy. A careful, comprehensive assessment by skilled staff that addresses individual need is necessary to develop alternative interventions. To encourage enthusiastic and responsive staff, they need to be trained to be flexible as fluctuations in the conditions of dementia mean the same intervention may not work on every occasion.

Importantly, a focus on leadership and its role in the promotion of person-centred care may assist in the reduction of restraint. Strong leadership, especially where the leadership facilitates positive interventions, is important (Jacobsen, et al., 2017). Furthermore, to achieve this, it is essential to incorporate a decision-making process alongside person-centred care (Jacobsen et al., 2017) into educational programs. A restraint-free philosophy and cooperation among a multidisciplinary team to ensure optimal communications are critical to reducing restraint use in care settings (Bellenger et al., 2019).

4.2 Strengths and limitations

The scoping review strength is its focus on people with dementia. To our knowledge, no other review has had this focus. However, this scoping review has some limitations. The scoping review methodology does not conduct a formal appraisal of study quality. As a result, this may introduce possible sources of bias from the evidence used. However, the scoping review allowed us to provide an overview of all studies on restraint use in people with dementia living in RACFs, within the period selected. We also were challenged to summarise results from the included studies given the mixed study designs. Moreover, some intervention studies did not focus exclusively on residents with dementia and this may limit the generalisation of results. We only included studies which involved residents with dementia, excluding studies focused on the perspectives of health professionals, which may have reduced valuable information resources. A further limitation is an inclusion only of English literature.

5. Conclusions

There exists a large variability in the definition of restraint use in people with dementia living in RACFs. Despite the adverse events of restraint use, the evidence to reduce restraint use is still scarce and inconsistent. The limited evidence also highlights the complexity of restraint use in people with dementia living in residential care. More research about the decision-making process and development of effective interventions are needed, in particular for people with dementia.

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Conflicts of interest

The author(s) declare that they have no conflict of interests.

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Author Contributions

WM conceived and designed the study, LP and WM undertook data analysis and/or interpretation and prepared a first draft of the manuscript. All listed authors approved the final version of the manuscript.

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References

- Agens, J. (2010). Chemical and physical restraint use in the older person. *British Journal of Medical Practitioners*, 3(1), 302.
- Allen, R. S., Burgio, L. D., Fisher, S. E., Michael Hardin, J., & Shuster, J. L., Jr. (2005). Behavioral characteristics of agitated nursing home residents with dementia at the end of life. *The Gerontologist*, 45(5), 661-666.
- Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19-32. <https://doi.org/10.1080/1364557032000119616>
- Australia Government. (2019). Quality of care amendment (minimising the use of restraints) principles 2019). Office of Parliamentary Counsel, Canberra. https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Human_Rights/QualityCareAmendment
- Australia Medical Association. (2015). Restraint in the care of people in residential aged care facilities - 2015. Australia. <https://ama.com.au/position-statement/restraint-care-people-residential-aged-care-facilities-2015>.
- Barnett, R., Stirling, C., & Pandyan, A. D. (2012). A review of the scientific literature related to the adverse impact of physical restraint: Gaining a clearer understanding of the physiological factors involved in cases of restraint-related death. *Medicine, Science and the Law*, 52(3), 137-142. <https://doi.org/10.1258/msl.2011.011101>

- Bellenger, E. N., Ibrahim, J. E., Kennedy, B., & Bugeja, L. (2019). Prevention of physical restraint use among nursing home residents in Australia: The top three recommendations from experts and stakeholders. *International Journal of Older People Nursing*, 14(1), e12218. <https://doi.org/10.1111/opn.12218>
- Bleijlevens, M. H., Wagner, L. M., Capezuti, E., & Hamers, J. P. (2016). Physical restraints: Consensus of a research definition using a modified delphi technique. *Journal of the American Geriatrics Society*, 64(11), 2307-2310. <https://doi.org/10.1111/jgs.14435>
- Cassie, K. M., & Cassie, W. (2013). Racial disparities in the use of physical restraints in U.S. Nursing homes. *Health & Social Work*, 38(4), 207-213. <https://doi.org/10.1093/hsw/hlt020>
- Clarke, C., & Mantle, R. (2016). Using risk management to promote person-centred dementia care. *Nursing Standard*, 30(28), 41. <https://doi.org/http://dx.doi.org/10.7748/ns.30.28.41.s47>
- Dementia Australia. (2019). Key facts and statistics. <https://www.fightdementia.org.au/>
- Feng, Z., Hirdes, J. P., Smith, T. F., Finne-Soveri, H., Chi, I., Du Pasquier, J. N., Gilgen, R., Ikegami, N., & Mor, V. (2009). Use of physical restraints and antipsychotic medications in nursing homes: A cross-national study. *International Journal of Geriatric Psychiatry*, 24(10), 1110-1118. <https://doi.org/10.1002/gps.2232>
- Foebel, A. D., Onder, G., Finne-Soveri, H., Lukas, A., Denking, M. D., Carfi, A., Vetrano, D. L., Brandi, V., Bernabei, R., & Liperoti, R. (2016). Physical restraint and antipsychotic medication use among nursing home residents with dementia. *Journal of the American Medical Directors Association*, 17(2), 184.e189-114. <https://doi.org/10.1016/j.jamda.2015.11.014>
- Freeman, S., Spirigene, L., Martin-Khan, M., & Hirdes, J. P. (2017). Relationship between restraint use, engagement in social activity, and decline in cognitive status among residents newly admitted to long-term care facilities. *Geriatrics & Gerontology International*, 17(2), 246-255. <https://doi.org/10.1111/ggi.12707>
- Goethals, S., Dierckx de Casterle, B., & Gastmans, C. (2012). Nurses' decision-making in cases of physical restraint: A synthesis of qualitative evidence. *Journal of Advanced Nursing*, 68(6), 1198-1210. <https://doi.org/10.1111/j.1365-2648.2011.05909.x>
- Hamers, J. (2017). The prevention and reduction of physical restraint use in long-term care. In *Dementia in nursing homes* (pp. 219-228). Springer International Publishing. https://doi.org/10.1007/978-3-319-49832-4_16

- Hardiman, M., & Dewing, J. (2014). Critical ally and critical friend: Stepping stones to facilitating practice development. *International Practice Development Journal*, 4(1), 1-19.
- Henderson, J., Willis, E., Xiao, L., & Blackman, I. (2017). Missed care in residential aged care in Australia: An exploratory study. *Collegian*, 24(5), 411-416. <https://doi.org/https://doi.org/10.1016/j.colegn.2016.09.001>
- Hofmann, H., & Hahn, S. (2014). Characteristics of nursing home residents and physical restraint: A systematic literature review. *Journal of Clinical Nursing*, 23(21-22), 3012-3024. <https://doi.org/10.1111/jocn.12384>
- Huang, H. C., Huang, Y. T., Lin, K. C., & Kuo, Y. F. (2014). Risk factors associated with physical restraints in residential aged care facilities: A community-based epidemiological survey in taiwan. *Journal of Advanced Nursing*, 70(1), 130-143. <https://doi.org/10.1111/jan.12176>
- Huizing, A. R., Hamers, J. P. H., Gulpers, M. J. M., & Berger, M. P. F. (2006). Short-term effects of an educational intervention on physical restraint use: A cluster randomized trial. *BMC Geriatrics*, 6, 17. <https://doi.org/10.1186/1471-2318-6-17>
- Jacobsen, F. F., Mekki, T. E., Forland, O., Folkestad, B., Kirkevold, O., Skar, R., Tveit, E. M., & Oye, C. (2017). A mixed method study of an education intervention to reduce use of restraint and implement person-centered dementia care in nursing homes. *BMC Nursing*, 16, 55. <https://doi.org/10.1186/s12912-017-0244-0>
- Karger, B., Fracasso, T., & Pfeiffer, H. (2008). Fatalities related to medical restraint devices—asphyxia is a common finding. *Forensic Science International*, 178(2), 178-184. <https://doi.org/10.1016/j.forsciint.2008.03.016>
- Koczy, P., Becker, C., Rapp, K., Klie, T., Beische, D., Buchele, G., Kleiner, A., Guerra, V., Rissmann, U., Kurrle, S., & Bredthauer, D. (2011). Effectiveness of a multifactorial intervention to reduce physical restraints in nursing home residents. *Journal of the American Geriatrics Society*, 59(2), 333-339. <https://doi.org/10.1111/j.1532-5415.2010.03278.x>
- Konetzka, R. T., Brauner, D. J., Shega, J., & Werner, R. M. (2014). The effects of public reporting on physical restraints and antipsychotic use in nursing home residents with severe cognitive impairment. *Journal of the American Geriatrics Society*, 62(3), 454-461. <https://doi.org/10.1111/jgs.12711>

- Kong, E. H., Choi, H., & Evans, L. K. (2017). Staff perceptions of barriers to physical restraint-reduction in long-term care: A meta-synthesis. *Journal of Clinical Nursing*, 26(1-2), 49-60. <https://doi.org/10.1111/jocn.13418>
- Kopke, S., Muhlhauser, I., Gerlach, A., Haut, A., Haastert, B., Mohler, R., & Meyer, G. (2012). Effect of a guideline-based multicomponent intervention on use of physical restraints in nursing homes a randomized controlled trial. *JAMA-Journal of the American Medical Association*, 307(20), 2177-2184. <https://doi.org/10.1001/jama.2012.4517>
- Kuske, B., Luck, T., Hanns, S., Matschinger, H., Angermeyer, M. C., Behrens, J., & Riedel-Heller, S. G. (2009). Training in dementia care: A cluster-randomized controlled trial of a training program for nursing home staff in germany. *International Psychogeriatrics*, 21(2), 295-308. <https://doi.org/10.1017/S1041610208008387>
- Lan, S. H., Lu, L. C., Lan, S. J., Chen, J. C., Wu, W. J., Chang, S. P., & Lin, L. Y. (2017). Educational intervention on physical restraint use in long-term care facilities - systematic review and meta-analysis. *Kaohsiung Journal of Medical Sciences*, 33(8), 411-421. <https://doi.org/10.1016/j.kjms.2017.05.012>
- Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5(1), 69. <https://doi.org/10.1186/1748-5908-5-69>
- Lin, L. C., Wu, S. C., Kao, C. C., Tzeng, Y. L., Watson, R., & Tang, S. H. (2009). Single ability among activities of daily living as a predictor of agitation. *Journal of Clinical Nursing*, 18(1), 117-123. <https://doi.org/10.1111/j.1365-2702.2008.02367.x>
- Luo, H. B., Fang, X. M., Liao, Y. L., Elliott, A., & Zhang, X. Z. (2010). Associations of special care units and outcomes of residents with dementia: 2004 national nursing home survey. *Gerontologist*, 50(4), 509-518. <https://doi.org/10.1093/geront/gnq035>
- Luo, H. B., Lin, M., & Castle, N. (2011). Physical restraint use and falls in nursing homes: A comparison between residents with and without dementia. *American Journal of Alzheimers Disease and Other Dementias*, 26(1), 44-50. <https://doi.org/10.1177/1533317510387585>
- Mamun, K., & Lim, J. (2005). Use of physical restraints in nursing homes: Current practice in singapore. *Annals of the Academy of Medicine Singapore*, 34(2), 158-162.
- Möhler, R., Richter, T., Köpke, S., & Meyer, G. (2012). Interventions for preventing and reducing the use of physical restraints in long-term geriatric care - a cochrane review.

Journal of Clinical Nursing, 21(21-22), 3070-3081. <https://doi.org/10.1111/j.1365-2702.2012.04153.x>

Øye, C., Jacobsen, F. F., & Mekki, T. E. (2017). Do organisational constraints explain the use of restraint? A comparative ethnographic study from three nursing homes in Norway. *Journal of Clinical Nursing*, 26(13-14), 1906-1916. <https://doi.org/10.1111/jocn.13504>

Peisah, C., & Skladzien, E. (2014). The use of restraints and psychotropic medications in people with dementia: A report for alzheimer's Australia. Retrieved July, 16, 2020. <https://doi.org/https://agedcare.royalcommission.gov.au/system/files/2020-06/DEH.0001.0001.0006.pdf>

Pellfolk, T. J. E., Gustafson, Y., Bucht, G., & Karlsson, S. (2010). Effects of a restraint minimization program on staff knowledge, attitudes, and practice: A cluster randomized trial. *Journal of the American Geriatrics Society*, 58(1), 62-69. <https://doi.org/10.1111/j.1532-5415.2009.02629.x>

Peters, M. D., Godfrey, C., McInerney, P., Soares, C. B., Khalil, H., & Parker, D. (2017). Chapter 11: Scoping reviews. In: Aromataris e, munn z (editors). *Joanna Briggs Institute reviewer's manual*. The Joanna Briggs Institute, 2017. <https://reviewersmanual.joannabriggs.org/>

Putman, L., & Wang, J. (2007). The closing group: Therapeutic recreation for nursing home residents with dementia and accompanying agitation and/or anxiety. *American Journal of Alzheimer's Disease & Other Dementias*, 22(3), 167-175. <https://doi.org/10.1177/1533317507300514>

Rakhmatullina, M., Taub, A., & Jacob, T. (2013). Morbidity and mortality associated with the utilization of restraints. *Psychiatric Quarterly*, 84(4), 499-512. <https://doi.org/10.1007/s11126-013-9262-6>

Scheepmans, K., de Casterle, B. D., Paquay, L., & Milisen, K. (2018). Restraint use in older adults in home care: A systematic review. *International Journal of Nursing Studies*, 79, 122-136. <https://doi.org/10.1016/j.ijnurstu.2017.11.008>

Selbaek, G., Aarsland, D., Ballard, C., Engedal, K., Langballe, E. M., Benth, J. S., & Bergh, S. (2016). Antipsychotic drug use is not associated with long-term mortality risk in norwegian nursing home patients. *Journal of the American Medical Directors Association*, 17(5), 464.e461-467. <https://doi.org/10.1016/j.jamda.2016.01.016>

te Boekhorst, S., Depla, M., de Lange, J., Pot, A. M., & Eefsting, J. A. (2009). The effects of group living homes on older people with dementia: A comparison with traditional

nursing home care. *International Journal of Geriatric Psychiatry*, 24(9), 970-978.
<https://doi.org/10.1002/gps.2205>

Te Boekhorst, S., Depla, M. F. I. A., Francke, A. L., Twisk, J. W. R., Zwijsen, S. A., & Hertogh, C. M. P. M. (2013). Quality of life of nursing-home residents with dementia subject to surveillance technology versus physical restraints: An explorative study. *International Journal of Geriatric Psychiatry*, 28(4), 356-363.
<https://doi.org/10.1002/gps.3831>

Testad, I., Aasland, A. M., & Aarsland, D. (2005). The effect of staff training on the use of restraint in dementia: A single-blind randomised controlled trial. *International Journal of Geriatric Psychiatry*, 20(6), 587-590.

Testad, I., Ballard, C., Bronnick, K., & Aarsland, D. (2010). The effect of staff training on agitation and use of restraint in nursing home residents with dementia: A single-blind, randomized controlled trial. *Journal of Clinical Psychiatry*, 71(1), 80-86.
<https://doi.org/10.4088/JCP.09m05486oli>

Testad, I., Mekki, T. E., Forland, O., Oye, C., Tveit, E. M., Jacobsen, F., & Kirkevold, O. (2016). Modeling and evaluating evidence-based continuing education program in nursing home dementia care (medced)-training of care home staff to reduce use of restraint in care home residents with dementia. A cluster randomized controlled trial. *International Journal of Geriatric Psychiatry*, 31(1), 24-32.
<https://doi.org/10.1002/gps.4285>

Tilly, J., & Reed, P. (2008). Falls, wandering, and physical restraints: A review of interventions for individuals with dementia in assisted living and nursing homes. *Alzheimer's Care Today*, 9(1), 45-50.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., Lewin, S., Godfrey, C. M., Macdonald, M. T., Langlois, E. V., Soares-Weiser, K., Moriarty, J., Clifford, T., Tuncalp, O., & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169(7), 467-473. <https://doi.org/10.7326/m18-0850>

van Lieshout, F., & Cardiff, S. (2015). Reflections on being and becoming a person-centred facilitator. *International Practice Development Journal*, 5(4), 1-10.

Verbeek, H., Zwakhalen, S. M. G., Van Rossum, E., Ambergen, T., Kempen, G. I. J. M., & Hamers, J. P. H. (2014). Effects of small-scale, home-like facilities in dementia care

on residents' behavior, and use of physical restraints and psychotropic drugs: A quasi-experimental study. *International Psychogeriatrics*, 26(4), 657-668.

<https://doi.org/10.1017/S1041610213002512>

Voyer, P., Richard, S., Doucet, L., Cyr, N., & Carmichael, P. H. (2011). Precipitating factors associated with delirium among long-term care residents with dementia. *Applied Nursing Research*, 24(3), 171-178. <https://doi.org/10.1016/j.apnr.2009.07.001>

Wagner, L. M., McDonald, S. M., & Castle, N. G. (2013). Nursing home deficiency citations for physical restraints and restrictive side rails. *Western Journal of Nursing Research*, 35(5), 546-565. <https://doi.org/10.1177/0193945912437382>

Wang, W., & Moyle, W. (2005). Physical restraint use on people with dementia: A review of the literature. *Australian Journal of Advanced Nursing*, 22(4), 46-52.

Willemse, B. M., de Jonge, J., Smit, D., Dasselaar, W., Depla, M., & Pot, A. M. (2016). Is an unhealthy work environment in nursing home care for people with dementia associated with the prescription of psychotropic drugs and physical restraints? *International Psychogeriatrics*, 28(6), 983-994.

<https://doi.org/10.1017/S1041610216000028>

Table 1 Medical subject headings (MeSH) and keywords used in searches.

Search strategy	MeSH terms	Key words
Population	Dementia OR "Alzheimer Disease"	Dementia OR "cognitive impairment" OR Alzheimer* OR "cognitive decline" OR " <i>Cognition Disorders</i> "
Concept	MEDLINE "Restraint, Physical" OR "Immobilization" CINAHL "Restraint, chemical" OR "Restraint, physical" OR Immobilization EMBASE "Physical restraint" OR "Mechanical restraint"	restraint* OR "physical restraint*" OR "mechanical restraint*" OR "pharmacological restraint*" OR "medical restraint*" OR "chemical restraint*" OR "environment* restraint*" OR surveillance OR immobilisation OR immobilization OR "trunk restraint*" or bedrail* OR "bed rail*" OR "side rail*" OR belt* OR "containment measure" OR "cot side" OR "building design" OR belt* OR "posey belt*" OR "roll belt*" OR shackles OR "cloth bands" OR "wrist restraint*" OR straps OR vests OR "geriatric table*" OR "lean back chair*"
Context	MEDLINE "Nursing Homes" OR "Residential Facilities" OR "Assisted living facility" CINAHL "Residential Facilities" OR "Nursing Homes" EMBASE "Residential home" OR "Nursing home" OR "Assisted living facility"	"aged care" OR "assisted living" OR "nursing home" OR "long-term care" OR RACF OR "Residential Facilities" OR "care homes"

Table 2 Participant characteristics of included studies (n=23)

Source	Study type	Sample size (people with dementia)	Dementia type/severity	Behavioural and psychological symptoms of dementia
(Allen et al., 2005) USA	Prospective observational study	32 residents (87.34 ± 7.29 years) who died were compared with 32 residents (84 ± 6.96 years) who did not die during the clinical trial.	Cognitive impairment Died: MMSE score = 4.00 ± 5.61 Survivors: MMSE score = 4.75 ± 6.08	Direct observation during the last observational phase showed that residents who died were more verbally agitated (approximately 70 min $\pm$ 65 min) in comparison with survivors at the same phase (approximately 43 min $\pm$ 36 min).
(Cassie & Cassie, 2013) USA	Cross-sectional study	13,507 residents from 1,174 nursing homes	49% of the sample (n = 6,506) was diagnosed with dementia	About 28 percent (n = 3,683) demonstrated some type of behavioural problems.
(Foebel et al., 2016) Europe	Retrospective cohort study	532 residents with dementia from 57 nursing homes	Cognitive impairment (CPS score): Borderline impairment (6.6%) Mild to moderate impairment (52.8%) Severe impairment (40.6%)	Behaviours: Wandering (36.8%) Verbally abusive (32.5%) Physically abusive (21.8%) Socially inappropriate (29.9%) Disrobing in public (37.0%) Resists care (8.2%)
(Freeman et al., 2017) Canada	Longitudinal secondary data analysis	111,052 residents from 635 LTCFs between 2005 and 2011	Dementia diagnosis: Alzheimer's disease (18.4%) Dementia other than Alzheimer's (40.3%) Cognitive impairment: Mild-moderate cognitive impairment (CPS = 1-2): 31.2%	NA

Source	Study type	Sample size (people with dementia)	Dementia type/severity	Behavioural and psychological symptoms of dementia
			Moderate-severe cognitive impairment (CPS=3–6): 52.7%	
(Huizing et al., 2006) Netherlands	Cluster- randomised controlled trial	167 residents with dementia	Cognitive status (CPS, mean, SD) Intervention: 4.2±1.7 Control: 4.1±1.8	NA
(Koczy et al., 2011) Germany	Cluster- randomised controlled trial	333 restrained residents with cognitive impairment	Cognition (DSS, median, range) Intervention: 11 (2–15) Control: 10 (2–15)	CMAI (median, range) Agitated and inappropriate behaviours: 15.0 (10–41) vs 15 (10–43) Verbally agitated behaviours: 10 (6–28) vs 11 (6–34) Aggressive behaviours: 7 (7–31) vs 7 (7–32)
(Konetzka et al., 2014) USA	Retrospective study	Observations (N = 3.9 million) on 809,645 residents with severe cognitive impairment in 4,258 NHs in six states.	Cognitive impairment (CPS = 5 or 6): severe cognitive impairment	NA

Source	Study type	Sample size (people with dementia)	Dementia type/severity	Behavioural and psychological symptoms of dementia
(Kuske et al., 2009) Germany	Cluster-randomised controlled trial	321 residents from six NHs	Cognitive impairment: CDR score ≥ 1 (mild to severe dementia)	NA
(Lin et al., 2009) Taiwan	Cross-sectional study	375 residents with dementia living in eight dementia special care units	Cognitive impairment: Agitated: MMSE 6.02 ± 6.36 Not agitated: MMSE 8.78 ± 7.05	CMAI score >35 was found in 163 (43.5%) subjects, who were classified as having agitated behaviour.
(Luo et al., 2010) USA	Cross-sectional study	6,234 residents aged 65 years or older and with a diagnosis of AD or other dementia.	AD or other dementia	NA
(Luo et al., 2011) USA	Cross-sectional study	6576 Residents with AD or dementia and 6,759 residents without AD or dementia	AD or other dementia	NA
(Mamun & Lim, 2005) Singapore	Cross-sectional study	390 residents aged >65 years from 3 nursing homes	187 residents had dementia	93 residents had behavioural problems: Wandering 22 (23.7%) Shouting 34 (36.6%) Injury to self 29 (31.2%) Injury to others 8 (8.6%)
(Øye et al., 2017) Norway	Observations and interviews	Ethnographic investigation with residents with dementia and staff in 3 NHs	Residents living with dementia in nursing homes	NA

Source	Study type	Sample size (people with dementia)	Dementia type/severity	Behavioural and psychological symptoms of dementia
(Pellfolk et al., 2010) Sweden	Cluster-randomised controlled trial	355 residents with dementia from 40 care units	Cognitive impairment (The Gottfries cognitive scale, range 0–27): Intervention: 10.4±7.1 Control: 10.0±7.4	Behavioral index (range 0–75): Intervention: 10.4±7.3 Control: 10.6±7.6
(Putman & Wang, 2007) USA	Quasi-experimental study	16 long-term care residents with dementia	A MMSE score of 10-25 and a GDS score of severe cognitive impairment.	Participants had a score of at least 1 and a severity of 5 on the CMAI
(Selbaek et al., 2016) Norway	Longitudinal study	1,163 nursing home patients in 4 Norwegian counties	Dementia (CDR ≥1) was present in 932 (80.4%) patients.	NPI-NH: Psychosis subsyndrome: 2.8±5.1 Agitation subsyndrome: 5.8±8.0 Affective subsyndrome: 3.5±5.3 Apathy: 2.2±3.7
(te Boekhorst et al., 2009) Netherlands	Quasi-experimental study	67 residents with dementia in 19 group living homes and 97 residents with dementia in seven traditional nursing homes	MMSE: Group living homes: 15.4 (13.5–17.3) Traditional nursing homes: 10.3 (8.3–12.3)	NPI-Q: Group living homes: 12.1 (10.5–13.8) Traditional nursing homes: 11.7 (10.9–12.8)
(Te Boekhorst et al., 2013) Netherlands	Longitudinal study	192 residents with surveillance technology (n=170) or physical restraints (n=22).	GDS: Physical restraints: 6±0.6 Surveillance technology: 5±1.1	NPI-Q: Physical restraints: 11.9±6.4 Surveillance technology: 11.9±7.4

Source	Study type	Sample size (people with dementia)	Dementia type/severity	Behavioural and psychological symptoms of dementia
(Testad et al., 2005) Norway	Randomised controlled trial	151 residents with dementia in in four public nursing and residential homes	CDR stage: Intervention: 2.0±1.0 Control: 2.2±0.9	BARS: Intervention: 16.8 (10–42) Control: 17.3 (10–40)
(Testad et al., 2010) Norway	Randomised controlled trial	145 nursing home residents with dementia	FAST stage: Intervention: 6 ±1.0 Control: 6±3.25	CMAI: Intervention: 38±17 Control: 33±14.5
(Testad et al., 2016) Norway	Cluster- randomised controlled trial	274 residents with dementia from 24 care homes	CDR sum of box score: Intervention: 12.2±4.8 Control: 12.6±4.2	CMAI: Intervention: 40.2±11.7 Control: 45.3±14.3
(Verbeek et al., 2014) Netherlands	Quasi- experimental study	259 residents with dementia from small-scale living facilities (n=124) and traditional psychogeriatric wards (n=135)	MMSE: Smalls-scale: 11.1±7 Traditional wards: 10.5±6.6	CMAI: Non-aggressive behaviour: 10.75±5.72 vs 10.50±5.85 Aggressive behaviour: 10.47±4.93 vs 11.53±5.54 Verbally agitated behaviour: 7.90±5.23 vs 7.28±3.92
(Voyer et al., 2011) Canada	Cross-sectional study	155 long-term-care residents with dementia	Severity of dementia: Mild: 5 (3.2%) Moderate: 113 (72.9%) Severe: 37 (23.9%)	NA

Abbreviations: NA, Not Available; AD, Alzheimer's Disease; MMSE, Mini-Mental State Examination; CPS, Cognitive Performance Scale; LTCFs, Long-term Care Facilities; DSS, Dementia Screening Scale; CMAI, Cohen-Mansfield Agitation Inventory; NHs, Nursing Homes; CDR, Clinical Dementia Rating; GDS, Global Deterioration Scale;

CDR, Clinical Dementia Rating scale; NPI-NH, the Neuropsychiatric Inventory-Nursing Home Version; NPI-Q, the Neuropsychiatric Inventory-Questionnaire; BARS, Brief Agitation Rating Scale; FAST, Functional Assessment Staging.

Table 3 Characteristics and outcomes of included studies (n=23)

Source	Aim	Definition (a)	Key findings that relate to objectives	
(Allen et al., 2005) USA	To examine group differences in bed restraint among agitated nursing home residents who died during a 6-month clinical trial compared with residents who did not die during the trial.	physical restraint	Residents who died displayed almost twice as much time restrained in bed during observation time in comparison with residents who did not die during the clinical trial.	h
(Cassie & Cassie, 2013) USA	To determine if black residents were more susceptible to the use of physical restraints.	<ul style="list-style-type: none"> • bed rails • side rails • trunk restraints 	Black residents are more likely to be physically restrained than white residents after controlling for characteristics such as dementia.	f
(Foebel et al., 2016) Europe	To explore antipsychotic (AP) medications and physical restraint use and their effects on physical function and cognition in older nursing home residents with dementia.	<ul style="list-style-type: none"> • bed rails • chair restraints • trunk restraints 	<ul style="list-style-type: none"> • 169 (31.8%) were physically restrained; • 45% were restrained with trunk restraints and 55% by chair restraints; • The rate of AP medication use was strongly correlated to physical restraint use; • ADL decline was highest in the group receiving both AP medications and physical restraints; • The group restrained with both physical restraints and AP medications had the highest frequency of cognitive decline. 	b c f h h

Source	Aim	Definition (a)	Key findings that relate to objectives	
(Freeman et al., 2017) Canada	To examine the role of physical restraint use, use of antipsychotic medications and engagement in social activities to affect change in cognitive status and drive cognitive decline among residents stratified based on the presence/absence of diagnosis of dementia.	<ul style="list-style-type: none"> • trunk restraint • limb restraint • chair prevents rising • Use of full bed rails and side rails were not included 	<ul style="list-style-type: none"> • Residents with dementia were more likely to have one or more physical restraint; • More than one in five residents with a diagnosis of dementia who were restrained showed cognitive decline compared with who were not physically restrained; • Residents with dementia showed an increased risk for cognitive decline if they had one or more physical restraints. 	f h h
(Huizing et al., 2006) Netherlands	To investigate the short-term effects of the intervention of education and consultation with a nurse specialist on the use of physical restraints <ul style="list-style-type: none"> • Duration: 2 months • Content: the decision-making process towards restraint use, the effects and consequences of restraint use, strategies to analyse risk behaviour of residents and alternatives for restraints. • Staff: nurses 	<p>Any devices with limitation on an individual's freedom of movement:</p> <ul style="list-style-type: none"> • bilateral bed rail • sleep suit • belt in bed • belt in chair • chair with a table • chair with a board • special sheet • safe seat • vest with belt • bedroom door locked • deep or overturned chair • infrared system 	<ul style="list-style-type: none"> • Physical restraints were used with 85 (59%) residents at baseline. The most frequently used restraints were bilateral bed rails (57%); • Residents (n = 145) were restrained once (17%), twice (9%), three (6%) or four times (27%) a day, with a mean of 1.59 a day; • Restraints were used most often at night (57%) compared to restraint use in the morning (32%), afternoon (32%) and evening (39%); • Restraint use did not change significantly over time in the experimental group compared to significant increased use in the control group. 	b d b i

Source	Aim	Definition (a)	Key findings that relate to objectives	
(Koczy et al., 2011) Germany	To evaluate the effectiveness of a multifactorial intervention with case consultation to reduce the use of physical restraints <ul style="list-style-type: none"> • Duration: 3 months • Contents: education about the education and decision-making process, adverse effects, and alternatives to restraint use • Staff: registered nurses. 	<ul style="list-style-type: none"> • use of belts tied to a chair or bed • chairs with fixed tables • bed rails were not included 	<ul style="list-style-type: none"> • Nearly 70% of the 333 restrained residents; • The probability of being free of restraints was more than twice as high in the IG as in the CG; • A reduction of restraint use of at least 75%, 50%, or 25% was also achieved approximately twice as often in the IG as in the CG. 	b i* i*
(Konetzka et al., 2014) USA	To assess whether reductions in physical restraint use associated with quality reporting may have had the unintended consequence of increasing antipsychotic use.	<ul style="list-style-type: none"> • daily use of physical restraints in the previous 7 days 	In residents with severe cognitive impairment, a marked increase in antipsychotic use accompanied the decline in physical restraint use.	h
(Kuske et al., 2009) Germany	To examine the effectiveness of the training intervention to improve the interaction between caregivers and residents <ul style="list-style-type: none"> • Duration: 3 months • Contents: caregiver's knowledge and competencies for dementia care. • Staff: nurses, geriatric nurses, 	Any kind of physical restraint: <ul style="list-style-type: none"> • bed rails • belts in bed • belts in chairs 	<ul style="list-style-type: none"> • The most frequently used restraint type were bedrails; • There was a significant difference in use of physical restraints between the IG and the CG and between the IG and the RG. 	c i*

Source	Aim	Definition (a)	Key findings that relate to objectives	
	nursing aids and occupational therapists			
(Lin et al., 2009) Taiwan	To investigate whether the interaction effect between restraint and functional ability and single ability during activities of daily living can predict agitation	<ul style="list-style-type: none"> • being restrained • restraint time 	Subjects being restrained had a higher occurrence of agitated behaviours.	h
(Luo et al., 2010) USA	To compare the rates of specialized care for residents with dementia in SCUs and other NH units and examine the associations of SCU residents with the process of care (e.g., physical restraints).	<ul style="list-style-type: none"> • trunk restraints • limb restraints • chairs that prevent rising • bed rails • side rails 	<ul style="list-style-type: none"> • There was little difference in using trunk/limb restraints; • SCU residents were more likely to have chair restraints; • SCU residents were less likely to have bed rails than those in regular units and those in NHs without an SCU. 	c c f
(Luo et al., 2011) USA	To estimate the use of different types of physical restraints and assess their associations to falls and injuries among residents with and without AD or dementia in US nursing	<ul style="list-style-type: none"> • trunk restraints • limb restraints • chairs that prevent rising • bed rails • side rails 	<ul style="list-style-type: none"> • Residents with dementia were more likely to be physically restrained; • Residents with dementia are less likely to have either full bed rails or side rails with an overall lower rate of either type of bed rail; • The use of trunk restraints in dementia residents was associated with 	f c h

Source	Aim	Definition (a)	Key findings that relate to objectives	
	homes.		a higher risk of falls and the use of full bed rails was associated with a lower risk of falls;	
			<ul style="list-style-type: none"> The use of trunk restraints in dementia residents was associated with a higher risk of fractures. 	h
(Mamun & Lim, 2005) Singapore	To assess the indication, use and complications related to physical restraints in Singapore nursing homes.	Types of restraints <ul style="list-style-type: none"> One upper extremity Both upper extremity Body Mitten 	<ul style="list-style-type: none"> Out of 91 dementia residents, 59 (64.8%) were on physical restraints; Diagnosis of dementia is a risk factor that may predict the use of restraints in nursing home residents; 20 (22%) residents were restrained to prevent dislodgement of the feeding tube, 17 (18.7%) were restrained to prevent falls and 8 (8.8%) were restrained for agitation. 	b f e
(Øye et al., 2017) Norway	To examine contextual factors in relation to the education intervention and use of restraint.	The frequency of use of restraints assessed by a standardised interview of 25 items: <ul style="list-style-type: none"> physical restraint electronic surveillance force or pressure in medical examination or treatment any force or pressure in ADL 	<ul style="list-style-type: none"> Interactional restraint was the most frequently used restraint; The use of restraint related to the characteristics of individual residents and organisational conditions. 	c g

Source	Aim	Definition (a)	Key findings that relate to objectives	
(Pellfolk et al., 2010) Sweden	To evaluate the effects of a restraint minimisation education program on staff knowledge and attitudes and use of physical restraints. • Duration: 6 months • Contents: dementia, delirium, falls, physical restraints, complications of dementia and caring for people with dementia • Staff: nursing staff	Any technical device that inhibits a person's free physical movement, excluding bedrails.	• Residents in the intervention group were less likely to be physically restrained at follow-up.	i*
(Putman & Wang, 2007) USA	The Closing Group intervention (recreation activity) was developed to decrease restraint use and antipsychotic drug use.	Not clearly defined	• Nearly half of the mean-days did not require restraints - shown a positive effect on restraint reduction.	i*
(Selbaek et al., 2016) Norway	To assess the long-term mortality risk associated with antipsychotic drug (AP) use in nursing homes with 5 assessments over a 75-month follow-up period.	<ul style="list-style-type: none"> • mechanical • nonmechanical • electronic surveillance • force or pressure in medical examination or treatment • force or pressure in the performance of activities of daily living 	<ul style="list-style-type: none"> • 357 (30.7%) residents were restrained; • The use of restraints was associated with mortality risk. 	b h

Source	Aim	Definition (a)	Key findings that relate to objectives	
(te Boekhorst et al., 2009) Netherlands	To investigate the effects of group living homes on quality of life and functioning of people with dementia.	<ul style="list-style-type: none"> • Nursing home physicians or psychologists measured whether residents prescribed one or more physical restraints. 	<ul style="list-style-type: none"> • A significant difference was found in the use of physical restraints (10% vs 50%). 	i*
(Te Boekhorst et al., 2013) Netherlands	To explore whether nursing-home residents with dementia subjected to surveillance technology had a better quality of life scores for mood, behavioural and societal dimensions than residents with physical restraints.	<ul style="list-style-type: none"> • deep chairs • chairs with a tabletop • chairs placed against a table and fixation in bed • chairs with belts • restraining blankets 	<ul style="list-style-type: none"> • Surveillance technology was predominantly used in residents with medium ADL dependency while physical restraints were predominantly used in residents with high ADL dependency. 	f
(Testad et al., 2005) Norway	To reduce problem behaviours and the use of restraint in demented patients using a staff training program as an intervention <ul style="list-style-type: none"> • Duration: 7 months • Contents: dementia, aggression, problem behaviour, decision-making process and alternatives towards use of restraint • Staff: care staff 	<p>The frequency of use of restraints assessed by a standardised interview of 25 items:</p> <ul style="list-style-type: none"> • physical restraint • electronic surveillance • force or pressure in medical examination or treatment • any force or pressure in ADL 	<ul style="list-style-type: none"> • The use of restraint was significantly lower in the intervention group compared to the control group. 	i*

Source	Aim	Definition (a)	Key findings that relate to objectives	
(Testad et al., 2010) Norway	To determine whether an education and supervision intervention could reduce the use of restraints <ul style="list-style-type: none"> • Duration: 7 months • Contents: knowledge, attitudes and practices of care staff • Staff: all care staff 	The frequency of use of restraints assessed by a standardised interview of 25 items: <ul style="list-style-type: none"> • physical restraint • electronic surveillance • force or pressure in medical examination or treatment • any force or pressure in ADL 	<ul style="list-style-type: none"> • The change in the interaction restraint use over time differed significantly between two groups, but the beneficial effect was not sustained at the 12-month assessment. 	i*
(Testad et al., 2016) Norway	To evaluate the effectiveness of a tailored 7-month training intervention in reducing use of restraint <ul style="list-style-type: none"> • Duration: 6 months • Contents: person-centred care and decision-making process, understand the relationship between resident and care staff • Staff: all care staff 	The frequency of use of restraints assessed by a standardised interview of 25 items: <ul style="list-style-type: none"> • physical restraint • electronic surveillance • force or pressure in medical examination or treatment • any force or pressure in ADL 	<ul style="list-style-type: none"> • The most frequent form of restraint was the use of force in showering or bathing situations; • Use of restraint was significantly reduced in both the intervention group and the control group despite unexpected low baseline, with a tendency to a greater reduction in the control group. 	c i

Source	Aim	Definition (a)	Key findings that relate to objectives	
(Verbeek et al., 2014) Netherlands	To explore the effects of small-scale living facilities on the behaviour of residents with dementia and the use of physical restraints and psychotropic drugs.	Five types of physical restraints: <ul style="list-style-type: none"> • belts (in bed and/or chair), • (wheel) chair with a locked table • chair on board, deep or overturned/reclined • (wheel)chair (i.e. chair preventing from raising), sleep suits • bilateral, fully enclosed bedrails 	<ul style="list-style-type: none"> • Significantly fewer physical restraints and psychotropic drugs were used in small-scale living facilities compared with traditional wards. 	i*
(Voyer et al., 2011) Canada	To investigate precipitating factors associated with delirium.	<ul style="list-style-type: none"> • abdominal belt • fixed tray table • rails on both sides of bed • any other type of mechanical means applied to limit a resident's mobility 	<ul style="list-style-type: none"> • 79 (51.3%) residents were restrained; • Use of physical restraints was the factor most associated with delirium that increases the odds of being delirious by 464%. 	b h

Abbreviations: LTCFs, long-term care facilities; MMSE, Mini-Mental State Examination; AP, antipsychotic; SCU, special care unit; AD, Alzheimer's disease; NH, nursing home; ADL, activities of daily living; IG, intervention group; CG, control group; RG, relaxation group; CI, confidence interval;

Outcomes related to the objectives: (a) definition; (b) prevalence; (c) type; (d) frequency; (e) reason; (f) risk factor; (g) decision process; (h) adverse events; and (i) interventions to reduce restraint use (* indicates favourable effects for intervention group)

FIGURE 1 PRISMA flow diagram