Belt Restraint Reduction in Nursing Homes: Effects of a Multicomponent Intervention Program

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OBJECTIVES: To test the effects of a multicomponent intervention program to reduce the use of belt restraints in psychogeriatric nursing homes.

DESIGN: A quasi-experimental longitudinal design. Study duration was 8 months.

SETTING: Twenty-six psychogeriatric nursing home wards in 13 Dutch nursing homes were assigned to intervention or control groups.

PARTICIPANTS: Seven hundred fourteen residents were selected for participation. Legal representatives of 520 residents agreed on participation; complete data are available for 405 residents.

INTERVENTION: The intervention program included four major components: promotion of institutional policy change that discourages use of belt restraint, nursing home staff education, consultation by a nurse specialist aimed at nursing home staff, and availability of alternative interventions.

MEASUREMENTS: The primary outcome measure was the frequency of belt restraint use. Secondary outcomes included other types of physical restraints, psychoactive drug use, falls, and fall-related injuries. These data were collected at baseline and after 4 and 8 months. A trained, blinded observer measured the use of belts and other physical restraints types four times during a 24-hour period.

RESULTS: The intervention resulted in a 50% decrease in belt use (odds ratio = 0.48, 95% confidence interval = 0.28–0.81; P = .005). No increase occurred in the use of other types of restraints. No marked differences between the groups were found regarding psychoactive drugs, falls, and fall-related injuries.

CONCLUSION: A multicomponent intervention program led to a substantial reduction in use of belts, full-enclosure bedrails, and sleep suits without increasing the use of other physical restraints, psychoactive drugs, or falls and fall-related injuries. J Am Geriatr Soc 2011.

Key words: belt restraint; physical restraints; nursing home; multicomponent intervention; quasi-experimental longitudinal design.

Aapproximately 25 million people worldwide have dementia, and it is likely that this number will increase to approximately 81 million people by 2040.1,2 In the Netherlands, approximately 235,000 people have dementia, with nearly 40,000 of those residing in psychogeriatric nursing homes.3 Psychogeriatric nursing homes provide long-term care to mainly very frail, older adults with psychogeriatric disorders, especially people with dementia.4 The use of physical restraints, defined as any limitation in an individual’s freedom of movement,5 is common practice in nursing home care for residents with dementia. In the Netherlands, 10% to 14% of nursing home residents with psychogeriatric disorders are restrained with belts.6,7 Depending on varying definitions and reporting methods, the prevalence of physical restraint use is between 15% and 66% internationally.8,9 These definitions usually include devices worn by individuals that they cannot easily remove, including belts (materials attached to the waist), sleep suits (clothing that deters a person from undressing), special sheet (a fitted sheet that includes a coat and encloses a mattress), and devices attached to furniture (e.g., full-enclosure bedrails or (wheel)chairs with a locked tray table).
Although physical restraint use is not associated with a decrease in falls or fall-related injuries, these devices continue to be used to prevent falls.10-14 Because physical restraint use can contribute to problems with balance and coordination, as well as falls,10,13,16 the question arises as to why there remains a persistent perception of physical restraints as “safety measures.” The use of physical restraints results in greater risk of sustaining serious injury or death.15 Other known negative consequences of restraint use are, for example, pressure ulcers, loss of muscle strength and endurance, incontinence, and aggression.10,17,18 In addition, older adults report negative feelings about experiences with physical restraints, such as discomfort and demoralization.19 The use of physical restraints may also indicate a failure of staff to recognize and address the underlying causes of fall risk for these restrained residents. Evidence that the use of restraints is often an ineffective fall prevention strategy and can potentially increase risk of other untoward effects related to immobility supports the pursuit of effective alternative interventions to reduce their routine usage.

Several studies have reported findings from restraint reduction intervention programs.20–25 The most frequently used intervention is staff education. These educational programs typically focus on improving staff knowledge about the negative aspects of restraint use, assessment of restraint risk factors, and the decision-making process for implementing alternative nonrestraint measures that specifically target the resident’s underlying problems.21,22,24,25 A successful educational-consultation intervention in the United States21 proved to be ineffective when modified for use in other countries.22,26–29 A study in three European countries (the Netherlands, Germany, and Switzerland) indicated that nursing staff have different attitudes and opinions regarding the use of physical restraints. These findings underscore the importance of employing more-adapted, culturally sensitive interventions to reduce restraint use in nursing homes in these countries.30 Also, these findings, similar to others, indicate that education regarding alternatives is not sufficient. The availability of alternative interventions for meeting underlying needs is essential to eliminating restraint use.22,26,27,30 Finally, legislation and related regulatory mandates that have changed individual nursing home restraint policies have also been shown to decrease restraint use. For example, in the United States, the introduction of the Nursing Home Reform Act (OBRA ’87) regulating the use of physical restraints led to a drastic reduction in their use.31,32

Based on these observations, a multicomponent intervention, Expelling Belts (EXBELT) was developed. Because belts are the most-restrictive physical restraint measure used in the Netherlands,12,33,34 EXBELT primarily focuses on these devices, although the principles apply to all physical restraints.30 A pilot version that was first implemented in one nursing home ward (n = 30 residents) resulted in a reduction from 12 to no belts over a single month after the intervention and only one belt at 3 and 9 months after the intervention.34 Expansion to the other four wards in the same nursing home showed similar results. The pilot intervention included four components: institutional policy change discouraging use of belt restraints, nursing home staff education, consultation by a nurse specialist aimed at nursing home staff, and availability of alternative interventions. The main aim of the current study was to test the effectiveness of EXBELT on reducing belt restraint usage in psychogeriatric nursing home care. Our three specific research questions were:

- Does a customized multicomponent intervention (EXBELT) result in a reduction of belt use in nursing homes?
- Does EXBELT reduce the use of other types of physical restraints and psychoactive drug use?
- Does belt elimination result in an increase in falls and fall-related injuries?

METHODS

Design and Sample

Data were obtained in a quasi-experimental longitudinal study with 8 months of follow-up. The study design is described in detail elsewhere.35 Twenty-six psychogeriatric wards from 13 nursing homes from various regions in the Netherlands with at least a 10% prevalence in use of belts were recruited. Belt use was defined as the restraining of a resident by a belt at least once per day. Wards were excluded if they provided care only to residents with Korsakoff syndrome, if they were undergoing extensive reorganization or constructional renovations, or if they were already participating in other restraint-reduction projects. Because of the geographical location of participating wards, overlap with regard to the nursing home staff could be expected. To avoid contamination bias, wards from nursing homes that were situated in close proximity were assigned to the same group. Because randomization according to ward or home was not feasible, the research team assigned wards and homes to the intervention (receiving the EXBELT intervention) or control (receiving care as usual) group. Six nursing homes (15 wards, 403 residents) were assigned to the intervention group and seven (11 wards, 311 residents) to the control group. Sample size calculations indicated that 216 psychogeriatric nursing home residents per group were needed to detect a targeted 50% reduction in belt use in the intervention group (two-sided alpha of .05). Based on an expected informed consent rate of 80% and a drop-out rate of 25% during 8 months of follow-up, the 714 eligible residents at baseline appeared to be adequate to test the aims.

Ethical Considerations

Because none of the potential participants were cognitively able to provide consent, written informed consent was obtained from the legal representatives of the residents after allocation of the wards to intervention and control groups. The medical ethics committee of the University Hospital Maastricht and Maastricht University and the ethical committees from four nursing home associations that represent the 13 nursing homes approved the study design and protocol.

Intervention Program

The implementation process of the EXBELT intervention program was an important aspect of this study, particularly
EXBELT comprises four key components:

- Implementation of an institutional policy change, which was implemented 4 months after baseline, including:
  - (a) Prohibition of the use of belt restraint for newly admitted residents and initiating belt restraint use for already admitted residents and overall reduction of current use of belt restraint.
  - (b) Written and oral communication regarding the forthcoming policy change provided by the nursing home management to all members of nursing home staff and to residents’ relatives during the first 4 months of the study after baseline. The policy change was announced to nursing home staff and legal representatives of the residents in a formal letter and announcements in internal newspapers and in group meetings aimed at the legal representatives of the residents.
  - (c) Oral communication regarding the policy change provided by the nurse specialists during the educational program to the nursing home staff (second month after baseline).

- Education: An intensive educational intervention program providing information about physical restraints and fall prevention, the negative aspects of physical restraint use, staff attitudes toward physical restraint use, how to make decisions regarding alternative interventions, and the use of resident-centered interventions. Two nurse specialists (registered nurses with extensive experience in physical restraint reduction) delivered this educational program to all 15 intervention wards during a 3-week period (one session per week), which was started 1 month after baseline. The educational program was offered to nursing home staff (physician, nurses, paramedical staff, psychologist, and ward manager). Each meeting lasted approximately 3 hours during nursing home staff’s working hours. A 90-minute educational session, summarizing the content of the 9 hours of education, was provided separately to members of the nursing staff who could not attend the program sessions.

- Consultation: The two nurse specialists who delivered the educational program also provided on-site consultation from the start of the educational program (Month 2) to the second posttest (T2) (Month 8) to individual nurses on the intervention wards regarding challenges in reducing restraints. The nurse specialists were available on demand, with each ward receiving at least two consultations. A nurse from each of the intervention wards and one of the nurse specialists analyzed specific resident cases and discussed possible solutions for reducing restraints. A nursing home manager and a representative from the Netherlands Health Care Inspectorate (IGZ, the regulatory body for monitoring quality and safety in the Netherlands nursing homes) were also available for consultation with nursing home managers and clinical staff if needed in individual cases.

- Availability of alternative interventions: nursing home managers in the intervention group provided resident-centered alternative interventions, such as hip protectors, infrared alarm systems, balance training, exercise, special pillows, and adjustable low-height beds. Alternative interventions were available from 1 month after baseline onward. The choice of alternative intervention resources to be purchased was made based on experience of the pilot EXBELT project and requests from staff members of the intervention wards. Extra costs were limited because requirements were mostly adaptations of planned purchases; for example, if beds had to be replaced anyway, those additional beds could be adjustable low-height ones. Nursing home staff suggested possible alternative interventions in consultation with resident’s relatives. The nurse specialist who provided on-site consultation facilitated decision-making regarding alternative interventions and encouraged the use of alternative interventions.

The fidelity of how the teaching and consultation were delivered was ensured by providing the nurse specialists with a script for the educational program. The principal researchers (MG, MB) served as the intervention supervisors to monitor the fidelity of the intervention components. Copies of consultation notes and other logs maintained by the nurse specialists were reviewed during monthly meetings of the principal researchers with both nurse specialists. These sessions provided feedback to the nurse specialists on their performance, generated potential strategies to improve the diffusion of the interventions, and made certain that the two nurse specialists delivered the interventions consistently.

Measurements

The primary outcome measure was belt restraint use; this was measured at baseline (T1) and after 4 (T2) and 8 (T3) months using an observation tool developed previously. The interrater reliability was found to be perfect (kappa = 1.0). A single trained observer, blinded to group assignment, recorded belt use as present or absent four times during a 24-hour period (morning, afternoon, evening, and night). The day and timing of measurements was unannounced to prevent any temporary removal of belts.

Secondary outcome measures included all other types of physical restraints (e.g., (wheel)chair with a locked tray table, special sheet, full-enclosure bedrails, chair on a board (chair whose legs are fixed to a board), deep or overturned (wheel)chair, sleep suit), use of at least one psychoactive medication (antipsychotic, antidepressant, tranquillizers, and hypnotic medication), and falls and fall-related injuries (e.g., hematomas, bruises, lacerations, joint dislocations, and fractures). Use of other types of physical restraint simultaneously with belt use was recorded as present or absent, using the same observation tool. Data on psychoactive drug use were collected from the residents’ medical records. Falls and fall-related injuries were recorded using an incident reporting system that Dutch nursing homes are required to maintain.
Data Analysis

Data from residents were used and analyzed according to the intention-to-treat principle. Only complete data sets were analyzed. Differences at baseline between the intervention and control groups with regard to belt use, psychoactive drug use, falls, and resident characteristics (age and sex) were investigated. Chi-square tests were used for categorical variables, and generalized estimating equation (GEE) techniques were used to estimate the effect on the main outcome variable (belts use), adjusting for baseline characteristics and dependence between measurements (age, sex, psychoactive drug use, falls, and nursing home). SPSS software version 15 and STATA 11 were used to perform these analyses (SPSS, Inc., Chicago, IL). Results are presented with odds ratios (ORs) and 95% confidence intervals (CIs).

RESULTS

Seven hundred fourteen residents were eligible for participation in this study. Informed consent was obtained from legal representatives of 520 residents, who were allocated to the intervention (319 residents from 15 wards in 6 nursing homes) or control group (201 residents from 11 wards in 7 nursing homes). After 8 months of follow-up, 22% (n = 69) of the residents had dropped out from the intervention group and 23% (n = 46) from the control group. Reasons for drop-out were similar in both groups and mostly due to death (Figure 1). Complete data were available (all three measurements) for 405 residents, and only these sets were included in the analyses. The total number of residents in the control group who could be included in the analyses was less than the number of residents needed according to the sample size calculations. There were no significant differences in baseline characteristics between the residents who completed all measurements and those who dropped out during follow-up, with the exception of sex (more male residents dropped out). Table 1 shows the baseline characteristics of the study groups. Baseline belt restraint use, sex, and falls in the preceding 3 months did not differ between the two groups. The mean age of the control group was somewhat higher (84.4 vs 82.1, P = .001).

Use of Belt Restraints

At baseline, belts were used for 19% of the residents in the control group and 17% in the intervention group (P = .70). At T2, the use of belts had decreased slightly in both groups (Table 2, Figure 2). Between T1 (17%) and T3 (9%), belt use had decreased nearly 50% in the intervention group, whereas the proportion of residents using belts in the control group was similar to baseline. The adjusted difference between the groups was significant (P = .01). GEE analysis showed a significant difference between the intervention and control groups regarding the use of belts (OR = 0.48, 95% CI = 0.28-0.81; P = .005). The reduction in belt use can mainly be attributed to a reduction in belts in (wheel)chairs. There was no difference in the use of belt restraints in bed (%) between the groups at any of the three measurements (Table 2).

Use of Other Physical Restraints

Table 2 shows a statistically significant unadjusted difference between the groups at T3 with regard to the number of residents who were restrained with any kind of physical restraint. After the intervention, more restraints were used in the control group at T3 (69%) than in the intervention group (54%) (P = .003). The greatest differences between the groups were found in the use of full-enclosure bedrails and sleep suits at T2 (P = .009 and P = .02, respectively) and T3 (P = .001 and P = .006, respectively), in favor of less usage in the intervention group (Table 2).

Psychoactive Drug Use and Falls and Fall-Related Injuries

At baseline, fewer residents used psychoactive drugs in the control group than in the intervention group (68% vs 74%; P = .15). Over time, there was a small (6%)
decrease in the intervention group, whereas the control group hardly changed (Table 2). At T3, there were no differences between groups.

No significant differences were found between the groups at baseline, T2, or T3 regarding the number of residents who fell or sustained a fall-related injury (including fractures). Belt elimination did not result in an increase of falls or in fall-related injuries (including fractures). The use of belts had stopped at T3 for 25 residents in the intervention group. This group had five falls and four injurious falls (with two fractures) at baseline and six falls and four injurious falls (with two fractures) at T3.

Availability and Use of Alternative Interventions

For almost 50% of the residents, in whom the usage of belt restraints was stopped, no alternative interventions were reported. Alternative interventions reported most often included sensor mats (21%) and low-height adjustable beds (12%).

DISCUSSION

The multicomponent intervention program EXBELT was effective in reducing the use of belt restraints. In previous studies aiming to reduce the use of physical restraints, intervention strategies were mainly delivered using staff education programs, combined in some studies with consultancy from a nurse specialist. Evidence of the success of this approach is moderate and inconsistent. Reported positive effects are mainly related to short-term effects in terms of prevention of

Table 2. Effects on Primary and Secondary Outcome Measures at Baseline and After 4 and 8 Months

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Follow-Up Period</th>
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<tbody>
<tr>
<td></td>
<td>T1 (Baseline)</td>
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<tr>
<td></td>
<td>Control%</td>
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<tr>
<td>Primary</td>
<td></td>
</tr>
<tr>
<td>Belt restraints</td>
<td>19</td>
</tr>
<tr>
<td>(Wheel)chair</td>
<td>16</td>
</tr>
<tr>
<td>Bed</td>
<td>6</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td>(Wheel)chair with a locked table</td>
<td>14</td>
</tr>
<tr>
<td>Special sheet</td>
<td>5</td>
</tr>
<tr>
<td>Full enclosure bedrails</td>
<td>59</td>
</tr>
<tr>
<td>Chair on a board</td>
<td>1</td>
</tr>
<tr>
<td>Deep or overturned (wheel)chair</td>
<td>9</td>
</tr>
<tr>
<td>Sleep suits</td>
<td>8</td>
</tr>
<tr>
<td>At least one physical restraint device</td>
<td>63</td>
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<tr>
<td>Falls</td>
<td>16</td>
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<tr>
<td>Fall-related injuries</td>
<td>10</td>
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<tr>
<td>Fall-related fractures</td>
<td>1</td>
</tr>
<tr>
<td>Psychoactive drug use</td>
<td>68</td>
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</table>

Effects were assessed using chi-square analyses.
restraint initiation, not reduction of use. Recent studies about overall physical restraint use confirm that education alone is not enough to reduce the use of physical restraints.29,41 In the current study, the effects on the first posttest (T2) were comparable with those in other studies that used only an educational intervention.21,22,28,38 At that moment, only the educational part of the intervention was completely implemented. The consultation activities of the nurse specialists increased after the educational part of the program. Between T2 and T3, they visited the intervention wards at least twice, but between baseline and T2, a nonsignificant reduction in belt use and other physical restraints was found in both groups. The reduction of belt restraint use in both groups may be the result of much media attention in the Netherlands and extra attention by the Dutch government to the reduction of belt use in nursing homes at the beginning of the current study because of fatal accidents and serious injuries resulting from belt restraint use.

In light of the inconsistent findings with regard to the effectiveness of educational programs, in some studies combined with consultancy from a nurse specialist, the literature provides clear evidence that additional actions are necessary to achieve more-effective reduction of physical restraints. The first is to focus on certain restraints, preferably the most-restrictive restraints, such as belt restraints.20 The second is to organize targeted institutions’ policies on reducing restraints.42 Finally, there are clear indications that an independent measurement is preferable to achieve reliable determination of physical restraint use, including determination of effectiveness of policies and interventions for restraint reduction. The effectiveness of auditing nursing homes in Australia is a clear illustration.43 In other countries (e.g., United States, Denmark), a policy change (stricter legislation, OBRA ’87) led to a significant reduction in some physical restraint usage. There are strong indications that the introduction of this stricter legislation reinforced the positive effects of education in the United States.31,32 Apart from the fact that the policy change described in the current study concerns no change in legislation, it is largely comparable with the introduction of OBRA ’87 in the United States.44 In the current study, two additional components were added to the EXBELT intervention protocol: institutional policy change regarding belt use and the availability of resident-centered alternative interventions.35 In the intervention wards, management of the nursing homes implemented the policy change shortly after T2. This policy change seemed to make an important contribution to the success of the EXBELT intervention.

Belt restraint reduction and use of alternative interventions with individual residents were discussed with legal representatives of the resident, physician, nurse, and ward manager. No alternative interventions were employed in 50% of all residents for whom belt restraints were removed in the intervention group. It seems that using belt restraints in these residents had become more common than necessary. The implementation of the EXBELT intervention thus made clear that there was not need for using belt restraints or any alternatives for belt restraints in these residents.

Although most of the significant difference in belt use between the control and intervention group at T3 can be attributed to a reduction in use of belts in (wheel)chairs, a statistically significant reduction in the use of other physical restraints in general was also found in the intervention group, especially full-enclosure bedrails and sleep suits. The use of belts in bed was the same for the intervention and control groups at each of the three measurements and decreased in both groups, from 6% to 3%, during the study. At the same time, the use of full-enclosure bedrails increased in the control group and decreased in the intervention group. The decision process regarding the use of new physical restraints during the night depended on which physical restraint type was to be used; for example, regarding belt restraint use, current practice is that the night head nurse contacts a physician for an order. Meanwhile, nurses make decisions about full-enclosure bedrails on the spot and then discuss them the next day with the physician. This may contribute to the preference at night for using less-restrictive physical restraints, such as full-enclosure bedrails, although education about the use and availability of alternative interventions to prevent bed-related falls may explain the decrease in use of these bedrails in the intervention group. With the use of adjustable low-height beds, for example, it is not necessary to use bedrails. The proportion of residents who used any kind of psychoactive drug was unchanged in either group. With regard to falls and fall-related injuries, this study confirms previous findings: a reduction in physical restraint usage, in particular belts, did not lead to an increase in falls and injurious falls.11,45 These results should be interpreted with caution because the number of participants available for analyses in the control group did not meet sample size calculations.

A quasiexperimental design was used to assign wards to the two study groups. For example, the nursing homes in one of two groups were assigned according to practical considerations, such as geographic location, for efficiency in conducting the training programs and taking measurements. This lack of randomization may have introduced selection bias. In research on complex interventions, the proper implementation and execution of the intervention is crucial but often underestimated. Therefore, the introduction of the EXBELT program was monitored carefully. No large problems or obstacles were encountered during its implementation. Another question is whether the effects of EXBELT continued after the study. It has often been reported that short-term benefits disappear over a longer time period. The results at T3 provide a positive indication of the potential long-term continuity of benefits, although this requires further research. The study was limited to psychogeriatric nursing homes, and thus, it is not clear whether these results can be obtained in other healthcare settings or in other target groups, or for what reason belts and other restraints were used and where and when falls occurred investigated.

In conclusion, this study shows that decreasing the use of belts and other physical restraints in nursing homes is attainable without an increase in psychoactive drug use, falls, or fall-related injuries. The success of the intervention lies in the combination of all components of EXBELT, including the education program, which provides the foundation for all of the other interventions. In addition, the comprehensiveness of planning and supervision of program
implementation and the intensive communication and spirit of cooperation among all those who participated in the program is important. Further research is important to explore whether the EXBET intervention is applicable to other countries, healthcare settings, and target groups. In addition, the dose–effect response and the long-term effects of the EXBET intervention need further exploration.

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