A structural multidisciplinary approach to depression management in nursing-home residents: a multicentre, stepped-wedge cluster-randomised trial

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Summary
Background Depression in nursing-home residents is often under-recognised. We aimed to establish the effectiveness of a structural approach to its management.

Methods Between May 15, 2009, and April 30, 2011, we undertook a multicentre, stepped-wedge cluster-randomised trial in four provinces of the Netherlands. A network of nursing homes was invited to enrol one dementia and one somatic unit per nursing home. In enrolled units, nursing-home staff recruited residents, who were eligible as long as we had received written informed consent. Units were randomly allocated to one of five groups with computer-generated random numbers. A multidisciplinary care programme, Act in Case of Depression (AiD), was implemented at different timepoints in each group: at baseline, no groups were implementing the programme (usual care); the first group implemented it shortly after baseline; and other groups sequentially began implementation after assessments at intervals of roughly 4 months. Residents did not know when the intervention was being implemented or what the programme elements were; research staff were masked to intervention implementation, depression treatment, and results of previous assessments; and data analysts were masked to intervention implementation. The primary endpoint was depression prevalence in units, which was the proportion of residents per unit with a score of more than seven on the proxy-based Cornell scale for depression in dementia. Analyses were by intention to treat. This trial is registered with the Netherlands National Trial Register, number NTR1477.

Findings 16 dementia units (403 residents) and 17 somatic units (390 residents) were enrolled in the course of the study. In somatic units, AiD reduced prevalence of depression (adjusted effect size –7·3%, 95% CI –13·7 to –0·9). The effect was not significant in dementia units (0·6, –5·6 to 6·8) and differed significantly from that in somatic units (p=0·031). Adherence to depression assessment procedures was lower in dementia units (69% [SD 19%]) than in somatic units (82% [15%]; p=0·045). Adherence to treatment pathways did not differ between dementia units (43% [SD 33%]) and somatic units (38% [40%]; p=0·745).

Interpretation A structural approach to management of depression in nursing homes that includes assessment procedures can reduce depression prevalence in somatic units. Improvements are needed in depression screening in dementia units and in implementation of nursing-home treatment protocols generally.

Funding The Netherlands Organization for Health Research and Development.

Introduction Depression is the main contributor to the growing burden of mental illness in nursing-home residents; it is associated with increased mortality, and use of healthcare services. In view of the under-recognition of depression in nursing homes, adequate depression management should include structural depression screening and diagnostic procedures (depression assessment). However, structural depression assessment with standardised procedures has seldom been done in nursing homes, and whether an approach to depression management including structural assessment procedures effectively reduces depression remains to be tested.

We tested the hypothesis that depression prevalence reduces in both dementia special-care units and somatic nursing-home units when standard care is transferred to a structural approach to depression management, including assessment procedures.

Methods
Study design and participants Between May 15, 2009, and April 30, 2011, we did a multicentre, stepped-wedge cluster-randomised trial. A stepped-wedge trial has a crossover design with repeated measurements and random allocation of timepoints for crossing over to the intervention (figure 1). This design enables comparisons within and between clusters, which maximises statistical power and necessitates fewer clusters than does a parallel cluster-randomised controlled trial (appendix).

By contrast with an explanatory trial that tests an intervention in ideal or selected conditions and investigates how and why an intervention works, a pragmatic trial tests whether an intervention is effective in real-life settings. Calls for pragmatic research have been made to maximise the applicability of interventions to the usual care settings. Because real-life settings could

www.thelancet.com Vol 381 June 29, 2013
Implementing intervention at 20 months varies from about 4 months (group 5) to 20 months (group 1). No clusters receive the intervention at baseline. They are randomly assigned to five groups that crossover to receive the intervention after measurements at 4-month intervals. How long a group has been receiving the intervention at the same nursing home, so that they could be allocated to the same cluster group to avoid contamination bias.

Randomisation and masking
Nursing-home units were the unit of randomisation, intervention, and primary analysis. RL (not involved in recruitment) randomly allocated units to one of five groups with computer-generated random numbers. He was provided with coded information about units located in the same nursing home, so that they could be allocated to the same cluster group to avoid contamination bias. Residents did not know when the intervention was being implemented or what the programme elements were. Interviewers who administered the outcome questionnaires were masked to intervention implementation or depression treatment, and to previous test results. Data analysts were masked to whether a specific resident had been exposed to the intervention and to when the intervention was implemented in a unit, but were not masked during post-hoc analyses.

Procedures
For this trial, UKON developed a multidisciplinary care programme, Act in Case of Depression (AiD), that involves nursing staff, activity therapists, psychologists, and physicians. The programme has three components: structured assessment with two-step screening and a diagnostic procedure; multidisciplinary treatment; and monitoring of treatment effects (figure 2, appendix). AiD prescribes pathways for collaborative treatment, for which several treatment protocols can be used (appendix). Nursing-home staff could use other evidence-based protocols when deemed necessary, but were requested to follow the pathways for collaborative treatment including psychosocial interventions. The research team explained the programme in formal sessions and offered support to the nursing-home staff (appendix).

At baseline, the programme had not been implemented in any groups. The programme was subsequently implemented directly after measurements at the assigned timepoint for each group (figure 1). When the units were not receiving the intervention, no specific information about AiD was provided to nursing-home staff and residents. No structural approach to depression management was used: depression was assessed after indications of possible depression were reported by nursing staff, a resident, or any other informant; teams did not use multidisciplinary pathways for depression treatment, which was provided ad hoc and was mainly in the form of drugs.

The primary endpoint was depression prevalence in units, which was the proportion of residents per unit with a score of more than seven on the proxy-based Cornell scale for depression in dementia (CSDD). The initial protocol prescribed use of the eight-item geriatric depression scale (GDS8) for the primary endpoint in somatic units. The protocol was changed in the first week of the study because many residents in somatic units could not be interviewed because of language or cognitive problems. Additionally, the use of the same scale and the same scoring method was deemed to be important for comparison of the two unit types. CSDD was used for the primary endpoint because, by contrast with GDS8, the scale can be used in residents with and without cognitive impairments and has been validated in people with and without dementia. The proxy-based CSDD had acceptable accuracy in a subsample of dementia units. To confirm the CSDD accuracy in somatic units, a depression diagnosis was established according to standardised

![Figure 2: Stepped-wedge design with six measurements and five cluster groups](image-url)

No clusters receive the intervention at baseline. They are randomly assigned to five groups that crossover to receive the intervention after measurements at 4-month intervals. How long a group has been receiving the intervention at the same nursing home, so that they could be allocated to the same cluster group to avoid contamination bias.
criteria in a subsample of 13 somatic units at the final measurement. The diagnosis was made collaboratively by the unit physician and psychologist, both of whom were masked to CSDD scores.

The secondary endpoints were CSDD severe depression, GDS8 depression, GDS8 severe depression, CSDD and GDS8 scores, and quality of life. A CSDD score of more than 11 indicated severe depression. GDS8 was used for self-reported depression outcomes in residents without severe cognitive impairments (mini-mental state examination [MMSE] score of 15 or higher). A GDS8 score of more than two indicated depression and more than four indicated severe depression. We used CSDS and GDS8 scores to assess the severity of proxy-reported and self-reported depressive symptoms in individual residents. Health-related quality of life was assessed with a visual analogue thermometer scale of the Euroqol-5 Dimensions (0=worst health state; 100=best health state).

Primary professional caregivers (for CSDD) and residents (for GDS8, quality of life, and MMSE) in each unit were interviewed at each timepoint by research staff who had been trained to use the scales. The extent to which the multidisciplinary teams adhered to AiD (0–100%) was conceptualised for each unit as the proportion of residents who should have received AiD components for whom nursing-home staff did assessment procedures and used treatment pathways. A score of 0% for assessment adherence meant that no structural assessment was undertaken for any of the unit’s residents. A score of 0% for treatment adherence meant that psychosocial treatment was not provided when prescribed and pharmacological treatment was not started or changed or monitored according to the AiD protocol when provided in usual care. The research team assigned scores on the basis of residents’ medical records and information from structured phone interviews with physicians, psychologists, and unit managers. Uncertainties were clarified in additional interviews with the nursing-home staff.

**Statistical analysis**

We calculated the sample size with the method described by Hussey and Hughes. We assumed that there would be 25 residents per somatic unit and 20 residents per dementia unit; depression prevalences of 22% and 30%; remission in 40% and 35% of residents; and 20% and negligible attrition. With an α of 0.05, a power of 0.8, and an intracluster correlation coefficient of 0.1, we calculated that we needed 16 clusters for each unit type in a stepped-wedge trial to allow multilevel analyses of depression prevalence.

For descriptive statistics, we used SPSS (version 19.0.0). We used ANOVA to compare baseline cluster characteristics and adherence rates in cluster groups. We used a Student’s t test to compare dementia and somatic units at baseline, and residents who completed the study (completers) and those who did not (non-completers) because of death, relocation, or withdrawal. We adjusted residents’ characteristics for clustering by comparing cluster means or proportions. We used a χ² test for categorical variables of units. To explore associations between CSDD and GDS8 scores, we identified partial correlations adjusted for age and sex at residents’ entry in the study. To confirm the CSDD accuracy in somatic units, we calculated the area under the receiver operating characteristic curve. A test with an area under the curve of between 0.5 and 0.7 was judged to have low discriminative accuracy, between 0.7 and 0.9 to have a moderate discriminative accuracy, and greater than 0.9 to have a high discriminative accuracy.

Because generalised linear mixed models did not converge, we fitted dichotomous variables using linear mixed models with random effects for units and for participants nested within units (SAS; version 9.2) to establish overall intervention effect across all timepoints. This method is acceptable for dichotomous variables.
Figure 3: Trial profile
NA=not assessed for primary endpoint because of administrative reasons or logistical difficulties. ID=incomplete data (more than four items of Cornell scale for depression in dementia missing).
when degrees of freedom are sufficient. We used the same method for continuous variables (quality of life and depressive symptoms). Mixed models account for repeated measurements and enable comparison of the test conditions within and between groups. Other than time trends, we adjusted all estimates for age, sex, region (province), and type of unit (somatic or dementia). To identify the intervention effect and to compare dementia and somatic units, we used likelihood ratio tests, comparing a model with the main intervention effect and its interaction with type of unit to a model without the interaction and then to a model without the main effect and interaction. Exploratively, we used linear and quadratic terms for the number of inter-assessment periods in the intervention condition (unit and resident levels), and the number of periods the resident was in the study. First, we added these terms and their interactions with the type of unit to the basic models and then deleted the terms that did not worsen the fit. Furthermore, we explored the intervention effects on GDS8 outcomes, including residents with MMSE scores of less than 15.

![Table 1: Baseline characteristics](https://www.thelancet.com/article/123456789)

Data are n, mean (SD), or n (%). Mean, SDs, and percentages calculated at the level of units. CSDD depression was defined as a CSDD score >7. CSDD severe depression was defined as a CSDD score >11.

GDS8 depression was defined as a GDS8 score >2. GDS8 severe depression was defined as a GDS8 score >4. Quality of life was assessed with a visual analogue scale of EuroQol-5D. CSDD = Cornell scale for depression in dementia. GDS8 = eight-item geriatric depression scale.

*Residents were recruited when informed consent had been obtained. †Residents were deemed to be enrolled when they had been assessed during at least one assessment. ‡One dementia unit with 15 residents was enrolled in group 5 after baseline; data for these residents at time of unit inclusion is reported as at baseline. §Percentages are prevalence after adjustment for clustering.

Table 1: Baseline characteristics
## Characteristics at enrolment by unit type

### Table 2: Data are mean (SD) or n (% [SD]), unless otherwise stated. All means, SDs, and percentages are adjusted for clustering.

<table>
<thead>
<tr>
<th>Dementia units (n=403)</th>
<th>Somatic units (n=290)</th>
<th>Total (n=793)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>83.4 (1.5)</td>
<td>77.4 (8.6)</td>
<td>80.3 (6.9)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td>280 (70% [11.5])</td>
<td>250 (64.2% [11.3])</td>
<td>520 (67.1% [12.5])</td>
</tr>
<tr>
<td>Score on mini-mental state examination</td>
<td>9.2 (3.2, n=293)</td>
<td>20.2 (3.3, n=312)</td>
<td>14.9 (6.4, n=606)</td>
</tr>
<tr>
<td>With CSDD depression</td>
<td>206 (52.4% [16.0], n=382)</td>
<td>122 (40.6% [12.0], n=312)</td>
<td>328 (46.3% [15.1], n=694)</td>
</tr>
<tr>
<td>With CSDD severe depression</td>
<td>91 (22.8% [12.0], n=382)</td>
<td>50 (17.4% [13.6], n=312)</td>
<td>141 (20.0% [12.9], n=694)</td>
</tr>
<tr>
<td>CSDD score</td>
<td>8.5 (1.9, n=382)</td>
<td>7.4 (2.0, n=312)</td>
<td>8.0 (2.0, n=694)</td>
</tr>
<tr>
<td>With GDS8 depression</td>
<td>19 (18.5% [24.4], n=90)</td>
<td>102 (44.8% [15.0], n=240)</td>
<td>121 (32.0% [23.9], n=330)</td>
</tr>
<tr>
<td>With GDS8 severe depression</td>
<td>11 (10.9% [16.8], n=90)</td>
<td>57 (26.8% [17.2], n=240)</td>
<td>68 (19.1% [18.6], n=330)</td>
</tr>
<tr>
<td>GDS8 score</td>
<td>1.2 (1.3, n=90)</td>
<td>2.6 (0.8, n=240)</td>
<td>1.9 (1.3, n=330)</td>
</tr>
<tr>
<td>Quality-of-life score</td>
<td>70.4 (7.4, n=270)</td>
<td>60.4 (6.3, n=279)</td>
<td>65.3 (8.4, n=469)</td>
</tr>
</tbody>
</table>

Data are mean (SD) or n (% [SD]), unless otherwise stated. All means, SDs, and percentages are adjusted for clustering.

### Table 3: Summary of enrolment for primary and secondary endpoints

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>Group 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum total number of measurements possible throughout the study</td>
<td>659</td>
<td>537</td>
<td>638</td>
<td>586</td>
<td>545</td>
</tr>
<tr>
<td>Total number of residents enrolled</td>
<td>182</td>
<td>148</td>
<td>166</td>
<td>160</td>
<td>137</td>
</tr>
<tr>
<td>CSDD measurements*</td>
<td>596 (90%)</td>
<td>494 (92%)</td>
<td>601 (94%)</td>
<td>556 (95%)</td>
<td>515 (94%)</td>
</tr>
<tr>
<td>Residents</td>
<td>174 (96%)</td>
<td>141 (95%)</td>
<td>166 (100%)</td>
<td>156 (98%)</td>
<td>136 (99%)</td>
</tr>
<tr>
<td>GDS8 measurements†</td>
<td>285 (43%)</td>
<td>167 (31%)</td>
<td>305 (48%)</td>
<td>149 (25%)</td>
<td>247 (45%)</td>
</tr>
<tr>
<td>Residents</td>
<td>97 (53%)</td>
<td>65 (44%)</td>
<td>97 (58%)</td>
<td>56 (35%)</td>
<td>80 (58%)</td>
</tr>
<tr>
<td>Quality-of-life measurements‡</td>
<td>328 (50%)</td>
<td>268 (50%)</td>
<td>389 (61%)</td>
<td>215 (37%)</td>
<td>305 (56%)</td>
</tr>
<tr>
<td>Residents</td>
<td>123 (68%)</td>
<td>111 (75%)</td>
<td>129 (78%)</td>
<td>98 (61%)</td>
<td>101 (74%)</td>
</tr>
</tbody>
</table>

Data are n or n (%). Mean number of measurements per resident was 3.7 (SD 1.9). CSDD= Cornell scale for depression in dementia. GDS8= eight-item geriatric depression scale. *Up to four missing items were imputed with the lowest possible score for 438 measurements; data missing because of administrative reasons or more than four missing items. †Up to two missing items imputed with lowest possible score for 129 measurements; no data assessed for 940 measurements; more than two but less than eight items were missing for 117, and 755 measurements were excluded because score on mini-mental state examination <15. ‡No imputation used for missing measurements.

### Results

33 units were enrolled in the course of the study (figure 3, table 1). The number of units and number of participating residents did not differ substantially between cluster groups (table 1), but significantly more units were located in one of the four provinces (p=0.026; appendix). Mean age, proportion of women, mean MMSE score, and the seven outcome variables were similar between groups at baseline and for newcomers (table 1). Loss to follow-up did not differ between somatic (mean proportion 42% [SD 17%]) and dementia units (46% [11%]; p=0.416).

At enrolment, depression was more prevalent in residents of dementia units than in those of somatic units (table 2). CSDD depression was more prevalent at entry into the study in residents who did not complete the study (161 [52%, SD 20%]; adjusted for clustering) of 320 than in those who did complete (167 [42%, 20%; adjusted for clustering] of 374; p=0.045).

Although assessments were indicated every 4 months, mean time between measurements varied because assessments took 4–6 weeks to complete and we were dependent on availability of nursing staff. Mean time between baseline and first measurement was 4.6 months [SD 0.6], between first and second measurements 3.8 months [0.6], between second and third measurements 3.6 months [0.5], between third and fourth measurements 4.4 months [0.5], and between the fourth and fifth measurements 5.1 months [0.7].

Overall, the primary endpoint was based on assessments for 773 residents during the study (table 3). Assessment protocols were indicated in 569 residents of units during intervention implementation, of whom 128 (23%) were neither screened nor diagnosed by the psychologist and physician. 191 (34%) received a diagnosis: 123 had depressive symptoms but no depression (55 in dementia units; 68 in somatic units);
five had major depression (according to DSM-IV-TR criteria; all in somatic units); 17 had minor depression (two to four symptoms according to criteria for major depression; all in somatic units); and 46 with dementia had depression according to the Provisional Diagnostic Criteria for Depression of Alzheimer’s Disease (38 in dementia units; 8 in somatic units). Treatment was indicated in 186 (33%; two who had been diagnosed died, two relocated, and two withdrew consent; for two other residents, no formal assessment was done, but treatment was indicated before crossing over to the intervention). Treatment algorithms were used for 92 patients (53 in dementia units; 39 in somatic units).

Overall, mean adherence to depression assessment (76% [SD 18%]) across all units for all timepoints was higher than adherence to treatment pathways (40% [36%]; p=0.0005). Adherence to assessment was lower in dementia units (69% [19%]) than in somatic units (82% [15%]; p=0.045). Use of treatment pathways did not differ between dementia units (43% [SD 33%]) and somatic units (38% [40%]; p=0.745). Adherence to assessment (p=0.394) and treatment (p=0.729) did not differ between groups. GDS8 score correlated weakly with CSDD score (r=0.23; p=0.018). The area under the receiving operating characteristic curve for CSDD in a subsample of somatic residents was 0.80 (95% CI 0.68–0.91; 154 residents, of whom 11 had a depression diagnosis according to standardised criteria).

Mean depression prevalence was 26.9% (SD 18.1%) in all somatic units across all timepoints when the intervention was being implemented and 40.0% (20.7%) in dementia units. Mixed models showed that, across all timepoints, prevalence of CSDD depression was not significantly associated with the type of unit (9.2% [95% CI −0.9 to 19.2] higher scores in dementia units than in somatic units; p=0.075). CSDD score decreased significantly after crossing over to the intervention condition in somatic units. The intervention had no significant effect on the CSDD outcomes in dementia units (table 4). Quality of life improved after the intervention in both types of unit (table 4). No significant intervention effects were recorded for GDS8 outcomes (table 4). Intervention duration and study duration terms could be deleted from the models for all CSDD outcomes and quality of life. GDS8 scores seemed to decrease for each assessment period that residents were in the study, irrespective of the test condition (table 4). When residents with low MMSE scores were included in GDS8 analyses, we recorded a significant effect of the intervention on GDS8 scores in somatic units (effect −0.2, 95% CI −0.5 to 0; p=0.048).

Sensitivity analyses showed that depression was more prevalent in non-completers than in residents who completed the study (difference in somatic units: 16.9%, 95% CI 0.9–24.9, p<0.0001; in dementia units 7.7%, 0.2–15.2, p=0.043). The difference between newcomers and individuals enrolled at baseline was not significant in somatic units (−1.3%, −7.2 to 4.6, p=0.672) or dementia units (8.7%, −1.0 to 18.3, p=0.078). The effect of attrition and of newcomers on depression prevalence did not differ between control and intervention conditions (interaction terms were not significant). When we controlled for these effects, the intervention effect in

<table>
<thead>
<tr>
<th>Dementia units</th>
<th>Somatic units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary endpoint</strong></td>
<td></td>
</tr>
<tr>
<td>CSDD depression†</td>
<td>0.6% (−5.6 to 6.8)</td>
</tr>
<tr>
<td><strong>Secondary outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>CSDD severe depression</td>
<td>2.4% (−2.4 to 7.2)</td>
</tr>
<tr>
<td>CSDD score</td>
<td>0.3 (−0.3 to 0.9)</td>
</tr>
<tr>
<td>GDS8 depression†</td>
<td>−4.5% (−15.0 to 6.0)</td>
</tr>
<tr>
<td>GDS8 severe depression†</td>
<td>−0.3% (−0.8 to 0.1)</td>
</tr>
<tr>
<td>GDS8 score</td>
<td>−0.3 (−0.7 to 0.1)</td>
</tr>
<tr>
<td>Quality-of-life score$</td>
<td>3.4 (0.5 to 6.3)</td>
</tr>
</tbody>
</table>

Effects were estimated with linear mixed models with random effects for nursing-home units and for residents nested within units, and are adjusted for sex, age, region, timepoints, intervention, and the interaction with the type of unit. CSDD depression was defined as a CSDD score >7. CSDD severe depression was defined as a CSDD score >11. GDS8 depression was defined as a GDS8 score >2. GDS8 severe depression was defined as a GDS8 score >4. Quality of life was assessed with a visual analogue scale of Euroqol-5D. CSDD Cornell scale for depression in dementia. GDS8 eight-item geriatric depression scale. *In explorative analyses, linear and quadratic terms and their interactions with the type of unit were used for the number of inter-assessment periods that the unit was implementing the intervention, that the resident was in the study. Only the term for the number of periods a resident was in the study could not be deleted in two models (GDS8 depression and GDS8 severe depression) without worsening the fit. †Intraclass correlation coefficient=0.051. ‡Both intervention effect and interaction effect with the type of unit can be eliminated from a model without worsening the fit; data presented for a full model with intervention effect and interaction. §Interaction effect with the type of unit was eliminated from a model without worsening the fit; data presented for the reduced model.

Table 4: Effects of the intervention
somatic units remained significant and similar in size for the primary endpoint (–6·7%, –13·2 to –0·3, p=0·042) and for CSDD score (–0·8, –1·4 to –0·1, p=0·022), and in both types of unit for quality-of-life score (3·4%, 0·5–6·3, p=0·023).

Adherence to assessment procedures was related to a reduction in prevalence of CSDD depression and decreased CSDD scores in somatic units, and increased quality-of-life scores in dementia units (table 5). Adherence to treatment pathways was not related to improved outcomes (table 5).

Discussion
We have shown that a structural approach to management of depression in nursing homes that includes assessment procedures can reduce depression prevalence in somatic units. The results of the secondary analyses of severity of depressive symptoms and quality of life supported this conclusion. Effects on quality of life suggested that a structural approach to depression management can be effective in dementia units.

The absence of an intervention effect on GDS8 outcomes could be due to a loss of power (60% missing data). Although validity of the geriatric depression scale can be questioned in severe cognitive impairment, explorative analyses including residents with cognitive impairments showed a small significant intervention effect in somatic units, which supports the idea of power loss. Additionally, the poor concordance between CSDD and GDS8 scores needs to be noted. It raises fundamental questions about what constitutes depression in the nursing-home population and who is the most appropriate assessor of depression. Towsley and colleagues26 reported a poor concordance between proxy-reported and self-reported CSDD scores in nursing homes. They emphasised that resident input during assessment of depression is essential but often clinically impractical in routine nursing-home practice. Training of caregivers can increase their capacity to detect depression in elderly people;25 in our trial, nursing staff were educated about depression and screening. Because GDS8 has been validated in nursing-home residents,23 and CSDD has acceptable accuracy in dementia unit residents and somatic unit residents (in our trial), the poor concordance between the scales could be explained by the fact that they measure different aspects of depression. GDS8 scores seemed to decrease irrespective of test condition. By contrast with CSDD, GDS8 does not measure non-mood symptoms, such as cyclic functions and retardation. These aspects might be affected by the intervention to a larger degree than mood symptoms.

Somatic residents with severe depression might benefit from the programme (negative effect numbers), but the effects on severe depression were not significant, which could be explained by imperfect use of treatment pathways. Health professionals could choose a treatment method other than those described in programme texts when they considered another method to be appropriate—eg, a psychologist could provide cognitive behavioural therapy instead of life review therapy. The implementation approach was mainly based on intrinsic motivation of professionals; external motivating factors, such as rewards and obligations, were not used.

Although pragmatic research is especially important for testing of interventions with elements that have been shown to be effective in controlled research settings, it is not appropriate for sound conclusions about how and why an intervention works. Post-hoc analyses provided more insight into AiD effectiveness: the primary intervention effect could be a result of a non-specific effect induced by structural assessment, which might raise nursing-home staff’s awareness of depression’ and induce changes in quality of daily care. Therefore, the absence of an effect on depression in dementia units might be explained by lower assessment adherence than in somatic units. However, it might also be explained by the convergence of symptoms of depression and dementia, such as psychomotor retardation, agitation, and anhedonia, which are included in the CSDD scale. Measured changes in depression could be affected by symptoms that are related to (worsening of) dementia. As expected, more residents with dementia were in dementia units than in somatic units.

To the best of our knowledge, ours is the first trial of a structural multidisciplinary approach to depression management that includes structural assessment in nursing homes (panel). Although the effect of AiD on the primary endpoint was not large, the total effect of the programme could be interpreted as clinically significant in somatic units and promising in dementia units.
because of the positive effect on quality of life. An effect size of 0.2 (the difference between group means divided by the pooled standard deviation at baseline) can be interpreted as the minimum clinically important difference between a new treatment and an alternative standard treatment. With the Bayesian interpretation of the 95% CI, the threshold value of 0.2 for the minimum difference, and the effect size of 0.6 for depression prevalence in our trial, the chance that the true value of the AiD intervention effect is beneficial for depression prevalence is estimated at 93%, which means that the programme is likely to be beneficial.

This trial has several strengths: the novel stepped-wedge cluster-randomised design; the large number of participating units and residents; use of both self-reported and proxy-reported outcomes; and the absence of exclusion criteria for the residents, which may increase generalisability. However, the generalisability is unknown because of potential selection bias. The AiD programme was operated on unit level and residents who did not provide informed consent should also have benefited from the programme. However, because we did not obtain data from residents who did not provide consent, we cannot be entirely sure whether participants from each unit formed a representative sample. Depression prevalence in our sample was within the 95% CI (mean 33.2%, 95% CI 12.4–58.4) reported in a meta-analysis of 13 studies reporting the detection of depression prevalence in our sample was within the 95% CI (mean 33.2%, 95% CI 12.4–58.4) reported in a meta-analysis of 13 studies reporting the detection of depression on the basis of self-reported scales in primary care, secondary care, and nursing homes. Other limitations of our study are worth noting. First, the focus of this effectiveness study was not on a specific treatment method but on a structural multidisciplinary approach to depression management including assessment algorithms. Although the trial showed beneficial effects of a structural approach and indicated that regular depression assessment was feasible and contributed to the positive effect, further research into implementation of evidence-based treatments is certainly needed. Second, we used a depression scale instead of a comprehensive diagnostic procedure, which would not have been possible in our study without unmasking the nursing-home staff.

Overall, individuals planning and delivering depression care should use a structural approach to depression management that includes regular screening and diagnostic procedures, such as AiD. Our programme provides useful and feasible algorithms for multidisciplinary assessment, and treatment protocols that are based on evidence and national and international guidelines. Education of staff about depression should be on nursing-home agendas, and further research and staff attention is needed for implementation of treatment protocols and treatment of severe depression. Finally, further research is needed into what constitutes depression in nursing homes and which symptoms can be most affected by an intervention.

Panel: Research in context

Systematic review

Although systematic screening in nursing homes is recommended, evidence that an approach to depression management that includes regular assessment procedures is effective is not available. In a systematic review that accompanied the funding application for the study of Act in Case of Depression (AiD), we searched PubMed for reports in Dutch or English published between Jan 1, 1997, and Dec 27, 2007. We identified two studies of integrated interventions combining psychiatric and nursing care. These same studies were also reported in Collet and colleagues’ systematic review. Brodaty and colleagues studied a formula-driven psychogeriatric team case management and a consultative approach in dementia, but did not report significant effects with the Cornell scale for depression in dementia and 15-item geriatric depression scale. In another randomised controlled trial, depression outcomes were improved by behavioural management in nursing and residential homes, training of caregivers by an old-age psychiatric hospital outreach team, and continuing support to individual workers. The training that caregivers received in our trial was supplemented with assessment procedures—a combination that was shown to be promising in residential homes. We subsequently did an extended search, including CINAHL and PsyctINFO, for reports published between Jan 1, 1995, and March 1, 2012, but did not identify any additional results for integrated interventions or depression management, including regular assessment procedures.

Interpretation

We have shown that a structural approach to depression management including systematic depression assessment can effectively reduce depression prevalence in somatic units of nursing homes and improve quality of life of residents of somatic units and dementia units. Health professionals who worked with AiD described it and its elements as feasible and useful. Although feasibility of assessment protocols was satisfactory, feasibility of treatment pathways was unclear, because adherence to these pathways was not optimum. Implementation studies are needed to define which strategies are effective for implementation of evidence-based treatment methods, how nursing-home staff can be equipped to implement innovations, and whether external motivating factors are warranted.

Contributors

DLG, MS, ST, MJFJV-D, and RTCMK designed the study. RL acquired data. RL, DLG, and ST supervised the study; analysed and interpreted data; provided administrative, technical, or material support; and drafted the report. RL and ST did statistical analyses. All authors revised the report. DLG, MS, ST, MJFJV-D, and RTCMK obtained funding.

Conflicts of interest

We declare that we have no conflicts of interest.

Acknowledgements

This study was funded by the Netherlands Organization for Health Research and Development. We thank Alexandra Evers-Stephan, Ellen Jooren, Arjanne van Leeuwen, and all research team members and nursing-home staff who contributed to the study.

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