Provider adherence to training components from the Trial to Reduce Antimicrobial use In Nursing home residents with Alzheimer’s disease and other Dementias (TRAIN-AD) intervention

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\textbf{ABSTRACT}

\textbf{Background}: The Trial to Reduce Antimicrobial use In Nursing home residents with Alzheimer’s disease and other Dementias (TRAIN-AD) was a cluster randomized clinical trial evaluating a multicomponent program to improve infection management among residents with advanced dementia. This report examines facility and provider characteristics associated with greater adherence to training components of the TRAIN-AD intervention.

\textbf{Methods}: Logistic regression was used to identify facility and provider characteristics associated with: 1. Training seminar attendance, 2. Online course completion, and 3. Overall adherence, defined as participation in neither seminar nor course, either seminar or course, or both seminar and course.

\textbf{Results}: Among 380 participating providers (nurses, N = 298; prescribing providers, N = 82) almost all (93%) participated in at least one training activity. Being a nurse was associated with higher likelihood of any seminar attendance (adjusted odds ratio (AOR) 5.37; 95% confidence interval (CI), 2.80–10.90). Providers who were in facilities when implementation begun (AOR, 3.01; 95% CI, 1.34–6.78) and in facilities with better quality ratings (AOR, 2.70; 95% CI, 1.59–4.57) were more likely to complete the online course. Prevalent participation (AOR, 2.01; 95% CI, 1.02–3.96) and higher facility quality (AOR, 2.44; 95% CI, 1.27–4.66) were also significantly associated with greater adherence to either seminar or online course.

\textbf{Conclusion}: TRAIN-AD demonstrates feasibility in achieving high participation among nursing home providers in intervention training activities. Findings also suggest opportunities to maximize adherence, such as enhancing training efforts in lower quality facilities and targeting of providers who join the facility after implementation start-up.

1. Background

Dementia afflicts more than 5 million Americans and is the sixth most common cause of death in the United States [1,2]. Most patients with advanced dementia die in the nursing home (NH) setting, where they frequently experience suspected infection episodes that are hallmarks of the end of life [3,4]. Yet, these episodes are widely mismanaged leading to adverse patient and public health outcomes [2-10].

Prior randomized controlled trials (RCTs) have demonstrated the efficacy of interventions to promote appropriate antimicrobial prescribing in NHs, but have never been adopted into practice [5-12]. Most often, these interventions are multicomponent programs which require NH providers to adhere to key parts of the protocol, such as participating in learning modules or antimicrobial prescribing algorithms. Thus, if such programs are to be effective in ‘real-world’ practice, there must be buy-in by the NH providers and programs must be feasibly integrated into the NH work flow [13].

A \textit{process evaluation} assesses the fidelity and quality of complex behavioral interventions implemented in RCTs to determine contextual or program-related factors associated with variation in outcomes [14, 15].
One key indicator of implementation fidelity is adherence; the degree to which participants adhere to an intervention as it was designed [16]. According to Carroll et al. [16–18], many factors at the individual and facility level, potentially influence the degree of a participant’s adherence. Little has been reported about factors associated with provider adherence to antimicrobial stewardship programs in the NH setting when tested in an RCT. However, such information could help inform successful adoption of these programs in practice.

The Trial to Reduce Antimicrobial use In Nursing home residents with Alzheimer’s disease and other Dementias (TRAIN-AD) was a cluster RCT evaluating a multicomponent program to improve infection management among NH residents with advanced dementia [19,20]. The objectives of this report are to describe and identify factors associated with NH provider adherence to two key training components of the TRAIN-AD intervention: 1. Attendance at a seminar, and 2. Completion of an online course.

2. Methods

2.1. Data source

The Hebrew SeniorLife Institutional Review Board approved this study’s conduct. Data for this report were drawn from the intervention arm of the TRAIN-AD study; a cluster RCT testing a multicomponent intervention to improve infection management for suspected urinary tract (UTIs) and lower respiratory tract (LRIs) infections among NH residents with advanced dementia in 28 Boston-area facilities (N = 14 facilities/arm). Full details of the trial design are provided elsewhere [19].

The intervention consists of the following components integrating infectious disease and palliative care principles for managing suspected UTIs and LRIs in patients with advanced dementia: 1. In-person provider training seminar, 2. An online interactive course for providers entitled ‘Infection Management in Advanced Dementia’, 3. Clinical management algorithms displayed on posters and laminated pocket cards, 4. Laminated pocket cards offering quick tips for providers to communicate with proxies, 5. Prescribing feedback reports for medical providers, and 6. A booklet entitled ‘Infections in Advanced Dementia: What the Family Should Know About Treatment Decisions’ for proxies.

The trial began in August 2017 and all data collection was complete by March 1, 2020, with the main findings published elsewhere [20]. This report leverages implementation data from the 14 NHs in the intervention arm.

2.2. Setting and population

Eligible NHs had greater than 60 beds and were located within 60 miles of Boston [20]. Study information was mailed to senior administrators, who were telephoned one week later by a research team member to solicit their facility’s participation, including their agreement to randomize their facility to either the intervention or control arm. For practical purposes, facilities were recruited and randomized in 5 sequential waves, roughly 4 months apart with 3–7 NHs per wave. At each intervention facility, a NH staff member (e.g., the infection preventionist or the director of nursing) was designated as the TRAIN-AD site champion. The champion’s role was to work with the research team, lead the intervention implementation and serve as the on-site resource for providers. There was a 3-month start-up period prior to intervention implementation at each facility. During this time, the research team met at least 3 times with the champion and other senior administrators. The goal of these meetings was to ensure that all systems were in place to maximize protocol compliance with implementation adaptions made to align with each NH’s particular work flow and culture.

The sample analyzed in this report were ‘targeted’ NH providers identified by the champion as having primary care responsibilities for advanced dementia residents defined as follows: 1. Nurses (registered or licensed practical nurses) caring for advanced dementia residents for a minimum of two shifts most weeks; and 2. Prescribing medical providers (physicians, physician assistants and nurse practitioners) with at least two advanced dementia residents on their regular patient panel. The champions identified targeted providers who were already working at the start of the implementation period (prevalent sample), as well as new targeted providers (e.g., new hires) during the 24-month implementation phase (incident sample). Targeted providers were mailed an orientation package prior to the start of the implementation period or at the time they were first identified that included information about the study and management principles, and instructions to each program component such as how to attend the training seminar and access the online course. Providers could refuse to participate in any or all of the intervention training components by contacting the research team either directly or via the site champion.

2.3. Training seminar and online course

The research team’s goal, in collaboration with the site champion, was to have all providers attend a training seminar and complete the online course within 3 months of being identified as a targeted provider either at start of (prevalent sample) or during (incident sample) the implementation period.

The provider training seminar was offered in two formats to maximize participation. Ideally, the targeted providers were asked to attend 1-h in-person group seminar (‘full’ seminar) at the NH which was offered at the start of the 24-month implementation phase and every 6 months thereafter. The times and dates of these seminars were in their orientation package and also communicated directly to them by the champion. The full seminars were led by one of three physician educators (EMES, ES, JDW), boarded in both geriatrics and palliative medicine, using the same content and structure. A didactic slide presentation explained the program’s rationale, components, management principles, and communication tips [22]. The didactic portion was followed by an open discussion. Targeted providers unable to attend the full 1-h group seminar were offered a 10-min one-on-one seminar (‘mini’ seminar) either in-person or by telephone delivered by either the TRAIN-AD champion or the research nurse. The mini seminar provided an abbreviated explanation of the rationale for the TRAIN-AD program and its components. Targeted provider training seminar completion was tracked by the research team in collaboration with the site champion for up to 3 months.

The other main activity that the targeted providers were asked to do was to complete a 1-h, online course entitled ‘Infection Management in Advanced Dementia’. This peer-reviewed course was co-designed by experts in advanced dementia (SLM) and infectious diseases (EMCD), and hosted by the Harvard Medical School Department of Continuing Education (HMS DCE) [23]. The course consisted of four virtual patient cases that illustrated principles on managing suspected UTIs and LRIs in advanced dementia, including the use of the TRAIN-AD algorithms to guide clinical management of suspected UTIs and LRIs. The course included three short videos to demonstrate best practice communication strategies informed by the VitalTalk program [22]. A 10-item pre- and post-test ascertained the learner’s knowledge, with a minimum post-score of 75% required for course completion.

The research team emailed each targeted provider at the time of facility start-up (prevalent sample) or when identified during the follow-up period (incident sample), a hyperlink and special code to access the online course. As such, course participation required the providers to share their email addresses. The research team was able to track providers who did or did not complete the course, and sent non-compliant providers weekly email reminders for up to 3 months. To incentivize participation, upon course completion, each provider received a $50 gift card and 1 continuing medical education (physicians, nurse practitioners, physician assistants) or 1 continuing education (nurses) unit for
which the usual fee was waived. In addition, facilities achieving 67% course completion were given a Chromebook by the research team to raffle among providers.

2.4. Variables

Outcomes were measured in three formats capturing provider adherence to (participation in) the training activities within 3 months of being invited to participate. The first outcome examined whether they attended a training seminar categorized as none, mini, or full. The second outcome analyzed whether the providers did or did not complete the online course. Finally, the third outcome categorized providers’ overall training adherence as having participated in neither the seminar nor the online course, either the seminar or the online course, or both the seminar and the online course.

Independent variables a priori associated with these outcomes [16–18,24,25] were selected from the TRAIN-AD database, and fell into two broad categories; characteristics of the individual provider, and characteristics of the intervention facility in which the provider worked. Individual provider data included: clinical discipline dichotomized as nurse or prescribing provider (physician, physician assistants, and nurse practitioners), and whether the provider was part of the prevalent or incident sample as defined above.

Facility-level factors included: the wave in which the NH was recruited (1, 2, 3, 4, 5 or 6; wave 1 was referent), total number of targeted providers in the NH (dichotomized at the median, N = 24); whether or not there was a change in site champion, and the number of enrolled residents at the start of the implementation period (dichotomized at the median, N = 12). Other facility data were obtained from three sources: LTCfocus.org website [21], Medicare.gov website (Medicare NH Compare) [26], and baseline survey administered to a senior NH administrator. Facility variables from LTC focus included the number of beds (dichotomized at the median, N = 133), profit versus non-profit status, and the total number of licensed and registered nurse hours/resident/day (dichotomized at the median, N = 1.4). Five-star NH quality rating, obtained from Medicare NH Compare, is a composite of rankings of health inspections, quality indicators, and staffing (range 0–5; higher scores indicate better quality of care) and was dichotomized at the median (score of 5) [27]. Finally, data were obtained from a telephone survey completed by a senior administrator at the start of facility enrollment that captured the intensity of the NHs’ infectious disease and palliative care practices prior to the TRAIN-AD study (see supplementary material A). Infectious disease practices were scored on a 0–4 scale (higher scores indicate greater intensity) based on the presence or absence of the following: infection preventionist, antibiotic stewardship program, and standardized protocols or initiatives for the diagnosis and treatment of suspected UTI and LRI infections. Palliative care practices were based on the administrators’ perceptions on how often (‘rarely’ = 1, ‘occasionally’/ ‘sometimes’ = 2, ‘often’ = 3, ‘almost always’ = 4) the following 6 practices occurred for residents with advanced dementia: hospice referral, palliative care consult, and discussions between providers and proxy discussions about infection management preference at the following time points: admission, regular care plan meetings, when a suspected infection occurred, and when a suspected aspiration occurred. The sum score of these 6 items was divided by 6 to simplify analysis, resulting in a total ranging from 1 to 4, with higher scores indicating greater palliative care practice intensity. For analytic purposes, both scales were dichotomized at the median using scores of 4 and 3 on the infectious disease and palliative care scales, respectively.

2.5. Analysis

Analyses were conducted with SAS 9.4 (SAS Institute, Inc., Cary, NC) and STATA 13.1 (College Station, TX). All analyses were conducted at the provider level. Medians and frequencies were used to describe all continuous and categorical variables, respectively. Binomial logistic regression was used to identify provider and facility characteristics (independent variables) associated with whether or not the provider completed the online course (outcome). Ordinal logistic regression was used to identify the association between the aforementioned independent variables with the two other outcomes: 1. training seminar attendance ordered as none (referent), mini, and full seminar; and 2. completion of neither the seminar nor course (referent), either the seminar or course, and both the seminar and course.

All previously described independent variables describing provider and facility characteristics were included in the three models. Bivariable analyses examined the unadjusted associations between each independent variable and the outcomes. Variables associated with the outcome at P < .10 in the unadjusted analyses were entered into a multivariable model. When possible, generalized estimating equations (GEE) were used to account for facility clustering. The replication of outcomes from three providers (0.9%) working in two facilities represented a minor violation of GEE in the respective models. Odds ratios (ORs) with 95% confidence intervals (CIs) were computed.
Table 2
Association between TRAIN-AD\(^a\) provider and facility characteristics (N = 380 providers) with seminar attendance.

| Characteristics\(^b\) | Providers Attended\(^c\) No. (%) | Odds Ratio\(^d\) for seminar attendance (95\% confidence interval) |
|---------------------|----------------------------------|-----------------------------------------------------------------|
|                      | No Seminar (n = 126) | 10-Minute Mini Seminar (n = 149) | 1-Hour Full Seminar (n = 155) |
| Provider             | (70.8) | (89.2) | (92.8) | Unadjusted | Adjusted |
| Nurse (vs prescribing provider) | 17 (48.6) | 126 (70.8) | 155 (92.8) | 5.55 (3.01–10.2)\(^e\) | 5.37 (2.80–10.30) |
| Prevalent group (vs incident)\(^f\) | 33 (94.3) | 147 (82.6) | 149 (89.2) | 1.22 (0.60–2.49) |
| Facility             |                      |                                  |                                |                                |                                |
| Allocation to wave 1 (versus later waves) | 6 (17.1) | 28 (15.7) | 30 (18.0) | 1.12 (0.56–2.24) |
| Enrolled providers >24 (median) | 26 (74.3) | 120 (67.4) | 115 (68.9) | 0.96 (0.50–1.87) |
| No champion turnover (vs any) | 18 (51.4) | 121 (68.0) | 119 (71.3) | 1.46 (0.84–2.54) |
| Enrolled residents >12 (median) | 13 (37.1) | 73 (41.0) | 88 (52.7) | 1.62 (0.93–2.81)\(^g\) |
| Beds >133 (median) | 23 (65.7) | 98 (55.1) | 88 (52.7) | 0.80 (0.45–1.43) |
| For profit status (vs non-profit) | 23 (65.7) | 89 (50.0) | 87 (52.1) | 0.89 (0.49–1.62) |
| Licensed and registered nurse/hour/resident/day >1.4 (median) | 6 (17.1) | 65 (36.5) | 64 (38.3) | 1.39 (0.82–2.37) |
| Five-star rating score of 5 versus <5(median)\(^h\) | 16 (45.7) | 95 (53.4) | 108 (64.7) | 1.69 (0.92–3.08)\(^i\) |
| Infectious disease practice score of 4 (median)\(^j\) | 18 (51.4) | 105 (59.0) | 105 (62.9) | 1.28 (0.67–2.43) |
| Palliative care practice > score of 3 (median)\(^k\) | 10 (28.6) | 81 (45.5) | 89 (53.3) | 1.64 (1.00–2.70)\(^l\) |

\(^a\) Trial to Reduce Antimicrobial Use in Nursing Home Residents with Alzheimer’s Disease and other Dementias.

\(^b\) Analyses done at the provider level.

\(^c\) Odds ratio derived from ordinal logistic regression model whereby no seminar was reference group and accounted for facility clustering using generalized estimating equations.

\(^d\) Variables significant at P < .10 in bivariable analyses and entered into the multivariable model.

\(^e\) Characteristics abstracted at baseline and medians calculated at the facility level.

\(^f\) Providers enrolled at time of facility start-up versus follow-up period.

\(^g\) Nursing Home Compare Five-star rating; range 0–5; higher scores indicate better care quality [24].

\(^h\) Infectious disease practice score is calculated using senior administrator survey responses about whether the facility had any of the following: infection prevention, antimicrobial stewardship program, and standardized protocols or initiatives for the diagnosis and treatment of suspected UTI and LRI infections.

\(^i\) Palliative Care practice score based on senior administrator survey responses about whether the facility had the following: access to hospice, access to palliative care consultations, and proxy discussions about infection management on admission, during regular care plan meeting, when a resident develops signs and symptoms of an infection, and following an event such as an aspiration. One point is given for each practice with total score; range 0–6; higher scores indicate greater intensity of infection disease practices.

3. Results

3.1. Provider and facility characteristics

The characteristics of the providers and the facilities in which providers worked are shown in Table 1. Providers (N = 380) were 298 (78.4%) nurses, and 82 (21.6%) prescribing providers (physicians 37 (9.7%), physician assistants 2 (0.5%), and nurse practitioners 43 (11.3%)). The majority of providers (N = 329, 86.6%) started participating in the program at the time of the facility start-up (i.e., prevalent sample). Most providers (N = 258, 67.9%) experienced no champion turnover in their facility. The distribution of providers in facilities with the following characteristics were: greater than 24 enrolled providers, N = 261 (68.7%); greater than 12 enrolled residents, N = 174 (45.8%); greater than 133 beds, N = 23 (65.7%); greater than 1.4 licensed and registered nurse hours/resident/day, N = 135 (35.5%); and a Five-star rating score of 5, N = 219 (57.6%). Most providers worked in facilities with an infectious disease practice score of 4 (N = 228, 60.0%) and palliative care practice score greater than 3 (N = 180, 47.4%).

3.2. Factors associated with seminar attendance

Among the 380 providers, 9.2% (N = 35) did not attend any seminar, 46.8% (N = 178) attended a mini on-one-one seminar, and 43.9% (N = 167) attended the full group seminar. Among the 298 nurses, 5.7% (N = 17) did not attend any seminar, 42.2% (N = 126) attended a mini seminar, and 52.0% (N = 155) attended the full seminar. Among the 82 prescribing providers, 21.9% (N = 18) did not attend any seminar, 63.4% (N = 52) attended a mini seminar, and 14.6% (N = 12) attended the full seminar. In unadjusted analyses, variables associated with greater training seminar attendance at P < .10 were: being a nurse (versus prescribing provider), enrollment of >12 residents in the facility, having a Five-star rating score of 5, and a palliative care practice score >3 (Table 2). In the multivariable model, being a nurse (AOR, 5.37; 95\% CI, 2.80–10.90) was the only factor that remained significantly associated with a higher likelihood of seminar attendance.

3.3. Factors associated with online course completion

Among the 380 providers, 67.6% (N = 257) completed the online course. A total of 56 providers (21.8%) did not provide an email address, and thus could not receive the course invitation. (These providers are...
Table 3

| Characteristics | Providers Completed the Online Course<sup>a</sup> (n = 257), No. (%) | Odds Ratio for Online Course Completion (95% CI) |
|-----------------|---------------------------------------------------------------------|---------------------------------------------|
|                 | With Characteristic | Without Characteristic | Unadjusted | Adjusted |
| Provider        |                        |                          |            |         |
| Nurse (vs prescribing provider) | 201 (78.2) | 56 (21.8) | 0.94 | (0.42–2.09) |
| Prevalent group (vs incident)<sup>b</sup> | 235 (91.4) | 22 (8.6) | 3.22 | (1.56–6.63)<sup>c</sup> | 3.01 | (1.34–6.78) |
| Facility        |                        |                          |            |         |
| Allocation to wave 1 (versus later wave) | 44 (17.1) | 213 (82.9) | 1.16 | (0.49–2.78) |
| Enrolled providers >24 (median) | 174 (67.7) | 83 (32.3) | 0.91 | (0.44–1.89) |
| No champion turnover (vs any) | 180 (70.0) | 77 (30.0) | 1.43 | (0.70–2.91) |
| Enrolled residents >12 (median) | 125 (48.6) | 132 (51.4) | 1.47 | (0.78–2.74) |
| Beds >133 (median) | 134 (52.1) | 123 (47.9) | 0.73 | (0.38–1.44) |
| For profit status (vs non-profit) | 128 (49.8) | 129 (50.2) | 0.64 | (0.31–1.34) |
| Licensed and registered nurse/hour/resident/day >1.4 (median) | 83 (32.3) | 174 (67.7) | 0.66 | (0.35–1.28) |
| Five-star rating score of 5 versus <5 (median)<sup>c</sup> | 168 (65.4) | 89 (34.6) | 2.90 | (1.77–4.75)<sup>d</sup> | 2.70 | (1.59–4.57) |
| Infectious disease practice score of 4 (median)<sup>d</sup> | 151 (58.8) | 106 (41.3) | 0.96 | (0.50–1.87) |
| Palliative care practice > score of 3 (median)<sup>d</sup> | 123 (47.9) | 134 (52.1) | 1.06 | (0.55–2.01) |

<sup>a</sup> Trial to Reduce Antimicrobial Use in Nursing Home Residents with Alzheimer’s Disease and other Dementias.
<sup>b</sup> Analyses done at the provider level. Completion ascertained within 3 months of enrollment via the Harvard Medical School Department of Continuing Education [31]web portal; among the 380 providers, 67.6% (N = 257) completed the course, but 21.8% (N = 56) did not provide their email address to receive the course invitation.
<sup>c</sup> Characteristics abstracted at baseline and medians calculated at the facility level.
<sup>d</sup> Providers enrolled at time of facility start-up versus follow-up period.

The vast majority of providers attended a training seminar, although

included in the analyses as not having done the course.) In unadjusted analyses, variables associated with a higher likelihood of online course completion at P < .10 were being among the prevalent (versus incident) group of providers and working in a facility with the highest rating on the Five-star NH quality rating score (Table 3). After multivariable adjustment, prevalent participation (AOR, 3.01; 95% CI, 1.34–6.78) and Five-star rating score of 5 (AOR, 2.70; 95% CI, 1.59–4.57) remained significantly associated with a higher likelihood of online course completion.

3.4. Factors associated with overall training adherence

Among the 380 providers, 7.1% (N = 27) completed neither a seminar nor the course, 27.4% (N = 104) completed either a seminar or the course, and 65.5% (N = 249) completed both a seminar and the course. In unadjusted analyses, variables associated with greater overall adherence at P < .10 were being among the prevalent (versus incident) group of providers and working in a facility with the highest rating on the Five-star NH quality rating score (Table 4). In the multivariable model, both prevalent participation (AOR, 2.01; 95% CI, 1.02–3.96) and the highest rating on the Five-star NH quality score (AOR, 2.44; 95% CI, 1.27–4.66) remained significantly associated with greater overall adherence.

4. Conclusion

The TRAIN-AD experience demonstrates that it is feasible to achieve high participation among NH providers to training activities in a multicomponent non-pharmacological intervention to improve infection management of suspected infections in advanced dementia. The findings also suggest opportunities to further maximize adherence, such as enhancing training efforts in lower quality NHs, offering alternative modes for seminars to reach non-nurse providers, and maximizing efforts to increase adherence among targeted providers who join the facility after the initial implementation start-up.

The NH environment is a very busy, highly regulated clinical environment in which it is notoriously difficult to successfully implement new programs [27]. Front-line providers are typically overwhelmed with the demands of routine care and have little capacity for additional tasks [24,28]. In this context, the high adherence rate we found in the TRAIN-AD training activities is notable. Several factors may have contributed to this success. First, we addressed an issue that was a high priority for key stakeholders, including these providers. The study was strongly endorsed by the senior administration, perhaps reflecting their need to respond the recent Centers for Disease Control mandate that called for NHs to expand antimicrobial stewardship activities. Earlier work has shown that these guidelines are often widely interpreted and when implemented, done so with few resources [29,30]. TRAIN-AD offered a ready-made way to implement these activities. Second, the pilot phase of TRAIN-AD revealed that front-line providers genuinely sought guidance in managing infections in advanced dementia residents, especially about how to talk to family members who insist their loved ones receive antimicrobials even when there was no clinical indication. Thus, the training provided particular structured guidance in having these conversations [22]. Third, we purposefully built in a 3-month start-up period at each intervention facility which served to build a strong rapport between the research team and the NH leadership, carefully plan training and program roll-out, and adapt implementation to the specific needs of each facility. Fourth, we engaged the facility champion in conducting training activities and tracking non-compliant providers. Finally, we added both academic (e.g., continuing education) and gift incentives to the providers.
nurses were more likely to do so. Nurses were also more likely to attend a full 1-h versus a 10-min mini seminar compared to prescribing providers (i.e., physician, nurse practitioners, and physician assistants). This is not surprising given that nurses are generally on-site on a daily basis and thus more readily available for a scheduled group seminar, whereas prescribing providers are commonly off-site. In fact, the mini one-on-one seminars were specifically designed to accommodate the unpredictable schedules of prescribing providers, and the fact that 63% of prescribing providers received the seminar in this modified format speaks to the importance of such adaptations to maximize adherence. Remarkably, 67% of providers completed the online course which, while speaks to the importance of such adaptations to maximize adherence.

unpredictable schedules of prescribing providers, and the fact that 63% whereas prescribing providers are commonly off-site. In fact, the mini -

...routine to have successful adherence [24]. NHs with higher quality ratings were more likely to adhere to the facility are more likely to buy in to program implementation and therefore higher rates of overall adherence. This aligns with findings from other literature that found that providers who were already working in a facility are more likely to buy in to program implementation and therefore more likely to participate in program activities [25]. Our finding that NHs with higher quality ratings were more likely to adhere to the TRAIN-AD seminars corroborates what has been found in other literature [24,31]. NHs with higher quality ratings frequently have more resources and therefore are more likely to have the capacity to participate in innovation and practice change [31]. Facilities with limited resources face additional challenges implementing new programs [32], and a high level of engagement by the site champion is particularly critical for lower-quality NHs to have successful adherence [24]. This study has some limitations. The report was unable to include all factors associated with implementation fidelity, such as perceptions of the program by the providers [18]. Structured surveys collecting such data are forthcoming at the trial’s conclusion, however qualitative methods would provide the best insight into the facilitators and barriers to their participation. Moreover, it is challenging to quantify NH leadership skills and champion engagement, and the extent to which these may play a role in intervention fidelity [18]. However, it was notable
that while one-third of TRAIN-AD intervention facilities experienced a turnover in site champions, this factor was not associated with provider adherence rates. Finally, TRAIN-AD was limited to NHs in the Boston area, and adherence to the program would likely differ in NHs located in other regions of the countries, particularly in facilities with limited resources.

Taken together, the TRAIN-AD experience confirms that a high level of provider adherence to multicomponent interventions can be achieved in NHs. We believe that key factors in our success included: addressing a priority issue for stakeholders, building a substantial start-up and planning period at each facility, including flexibility and variety in learning modalities, and direct engagement and accountability by site champions in the program roll-out. If the TRAIN-AD intervention proves to be efficacious, the next step would be to test its effectiveness on a larger pragmatic RCT. Successful scaling-up and adoption of the program in this next phase offers an opportunity to further optimize adherence to the TRAIN-AD intervention, particularly in lower quality NH facilities.

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Declaration of competing interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the design or conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

Appendix A. Supplementary data
Supplementary data to this article can be found online at https://doi. org/10.1016/j.conctc.2022.100913.

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