CLINICAL INVESTIGATION

Evaluating the relationship between facility Age-Friendly recognition and subsequent facility-free days in older Veterans

Robert E. Burke MD, MS[1,2,3] | **Andrew Tjader MS**[4] | **Kimberly Church MS**[5] |
Shannon Munro PhD, APRN-BC[6] | **Liam Rose PhD**[7,8]

[1]Center for Health Equity Research and Promotion, Corporal Crescenz VA Medical Center, Philadelphia, Pennsylvania, USA

[2]Division of General Internal Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, USA

[3]Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia, Pennsylvania, USA

[4]Center for Health Equity Research and Promotion, Pittsburgh VA Medical Center, Pittsburgh, Pennsylvania, USA

[5]Department of Veterans Affairs, Veterans Health Administration, Office of Geriatrics and Extended Care, Washington, DC, USA

[6]U.S. Department of Veterans Affairs, Veterans Health Administration, Innovation Ecosystem, Washington, DC, USA

[7]Health Economics Resource Center, Palo Alto VA Medical Center, Palo Alto, California, USA

[8]Stanford Surgery Policy Improvement Research and Education Center, Stanford University, Stanford, California, USA

Correspondence
Robert E. Burke, 423 Guardian Drive, 1232 Blockley Hall Philadelphia, PA 19104, USA.
Email: robert.burke2@pennmedicine.upenn.edu

Abstract

Background: Thousands of health systems have been recognized as "Age-Friendly" for implementing geriatric care practices aligned with the "4Ms" (What Matters, Medication, Mentation, and Mobility). However, the effect of Age-Friendly recognition on patient outcomes is largely unknown. We sought to identify this effect in the Veterans Health Administration (VHA)—one of the largest Age-Friendly integrated health systems in the United States.

Methods: There were 50 VA medical centers (VAMCs) recognized as Age-Friendly by December 2021. We used a time-event difference-in-difference analysis to identify the association of a VAMC's recognition as Age-Friendly on the change in facility-free days (days outside the hospital or nursing home) among Veterans treated at that facility. We also evaluated this association in three subgroups: Veterans at particularly high risk of nursing home entry, Veterans who lived within 10 miles of a medical center, and facilities that had reached Level 2 Age-Friendly recognition. We also evaluated individual components of the endpoint in terms of change in hospital and nursing home days separately.

Results: We found Age-Friendly recognition was associated with small statistically significant improvements in facility-free days (0.2% on a base of 97% facility-free days on average per year, or an additional 0.73 days per year on a base of 354 days). There were no differences in any subgroup, or any individual component of the endpoint across all groups.

Conclusions: At the individual level, an increase of 0.2% in facility-free days is a weak effect. However, sites were early in implementation, and facility-free days may not be a responsive outcome measure. However, across an entire population, small changes in facility-free days may accrue large cost savings. Future evaluations should consider a broader variety of process and outcome measures.

KEYWORDS
age-friendly, home days

INTRODUCTION

Many health systems currently struggle to provide high-quality, holistic care for every older adult at every care interaction. The Age-Friendly Health Systems (AFHS) movement, supported by the Institute for Healthcare Improvement (IHI) and The John A. Hartford Foundation, crystallizes high-quality geriatric care into four "M"s that should be addressed in every clinical encounter.[1,2] The "4Ms" are what Matters, Medication, Mentation, and Mobility. The AFHS movement has been rapidly adopted, with thousands of healthcare organizations now recognized as "Age-Friendly."[3]

IHI has two levels of recognition for clinical care settings working to implement the 4Ms framework. Level 1 (Participant) recognition is awarded to care settings that have developed an IHI-approved plan to implement the 4Ms during clinical encounters with older adults. Level 2 (Committed to Care Excellence) is awarded to care settings that submit 3 months of data to IHI demonstrating the early impact of 4Ms care. This is a one-time reporting requirement on the number of older adults who have received 4Ms care. Under this rubric, an entire site (e.g., an entire hospital) is recognized for starting their Age-Friendly journey, even if only one care area (e.g., an inpatient unit) within that medical center submits a 4Ms plan (Level 1) or measures data (Level 2).

AFHS represents one of the largest potential care transformations for older adults in the United States. Although the evidence base for each "M" is strong,[4] there is little evidence about how the implementation of the AFHS model impacts patient outcomes.[5] In particular, evaluating outcome measures (rather than process measures) that are meaningful to patients and health systems would be most useful. Emerging evidence suggests "facility-free" days (or home days) represent areas of potentially significant cost savings for health systems and matter to older adults.[6] Evaluations have been limited because health systems lack a standard data platform, and there is a diversity of approaches to Age-Friendly practices across and within care settings. The VHA is a uniquely advantageous setting to study Age-Friendly transformation. It is committed to being the largest integrated health care system recognized as Age-Friendly and has a common data platform across sites.[7] It also has a large older adult population: currently, 49% of Veterans enrolled in VA health care are age 65 or older and this proportion will grow, mirroring the US population.[8] We sought to measure the effect of Age-Friendly recognition on the number of days Veterans spend outside the hospital and nursing home ("facility-free days").

Key points

- Thousands of health care systems are recognized as Age-Friendly, but the impact of this recognition on patient-level outcomes is unknown.
- We identified 50 VA medical centers recognized as Age-Friendly by December 2021 and measured Veteran-level differences in facility-free days: days outside a hospital or nursing home.
- We found a small statistically significant increase in facility-free days (0.2 percentage points on a base of 97%) in facilities recognized as Age-Friendly, but were limited in identifying which Veterans received the entire intervention.

Why does this paper matter?

To our knowledge, this is the first evaluation of the relationship between Age-Friendly recognition and patient-level outcomes.

METHODS

Data sources

We used a VA Residential History File (RHF) that included all Veterans enrolled in VA across the country from January 1, 2018 to December 30, 2022.[9] The RHF includes VA and Medicare (fee-for-service and Medicare Advantage) stays to create longitudinal episodes of care for Veterans across all outpatient and inpatient care types. We merged this dataset with VA community care data to identify hospitalizations and nursing home stays that occurred outside the VA but were paid by VA for a comprehensive measure of utilization. We included a national dataset on Age-Friendly recognition by VA sites that is maintained by the VHA Office of Geriatrics and Extended Care (GEC).

Sample

We included enrolled Veterans age 65 or older with at least one VA outpatient encounter during each calendar year. All VAMCs were eligible to be included. We treated all care sites and patients associated with that site as exposed to Age-Friendly if any part of a VA site was recognized as Age-Friendly, as this is the nature of Age-

Friendly recognition. We used the Veteran's home station they were enrolled with during each calendar year; if this was missing, we used the facility in which the individual Veteran had the most visits to "assign" Veterans to medical centers.

Exposure

The primary exposure was AFHS recognition from IHI by December 2021. Thus, facilities could contribute a different number of months post-recognition depending on when this recognition occurred during the analytic period. We categorized facilities according to whether and when they had achieved Level 1 versus Level 2 recognition.

Outcome

Our primary outcome was "facility-free" days per year, similar to "home days" measures used in other studies.[6] This metric is Veteran-centered, captures care utilization that matters' to Veterans (e.g., days away from home in the hospital or nursing home), and provides a summative measure that may be responsive to 4Ms care. Since this metric does not have a standard definition in the literature, we worked with members of the GEC national program office to define the outcome. We concluded that if the data identified a Veteran spent the night in a hospital (including the Emergency Department or admitted to observation) or residential care setting (including inpatient rehabilitation settings and long-term nursing home care), this was considered a "facility" day. The exceptions to this rule were in Veterans already in long-term nursing or domiciliary care in the VA. For these Veterans, only hospital days were considered facility days. Secondary outcomes included individual components of the primary outcome: changes in days in the hospital, days in the Emergency Department, and days in nursing homes separately.

Subgroups

We analyzed the effect of Age-Friendly recognition on Veteran outcomes in three subgroups. First, we hypothesized that Veterans at the highest risk of nursing home placement might benefit most from Age-Friendly transformation. We used an internal risk score validated in the VA (called the High-Needs, High-Risk score) to identify a subgroup of Veterans at high-risk for nursing home placement. Second, since attributing Veterans to a

specific medical center was complex, we restricted the sample only to Veterans who lived within 10 miles of a medical center. Veterans who live further from their assigned medical center may be more likely to use other VAMCs for care also. Finally, we compared sites that had achieved Level 2 recognition with sites that had achieved Level 1 recognition.

Analytic approach

We performed a time-event difference-in-difference analysis with the outcome modeled linearly using ordinary least squares, using 3 years of pre-recognition data and up to 1 year of post-recognition data. We compared the outcomes of Veterans enrolled at facilities recognized as Age-Friendly to Veterans at all other medical centers in the VA not recognized as Age-Friendly at each point in time. We accounted for dynamic treatment effects.[10]

As a time-event study, a formal comparison of parallel pre-trends is not as accurate as might be required in a traditional difference in differences analysis. The reason for this is that exposed sites can "switch" from non-intervention to intervention group, and that the actual time of the intervention varies across facilities, making the pre- and post-periods variable across facilities. As a proxy, we compared the mean proportion of days at home between facilities who were Age-Friendly recognized and those that were not across our entire study period (Figure S1). We did not match facilities or patient characteristics as this can introduce significant confounding.[11,12] One of the strengths of a difference-in-differences approach is control for variables that differ between groups, as long as they are not time-varying and different between intervention and control groups. We did not identify any time-varying confounders that were different between the two groups of facilities. In addition, all the "intervention" sites in our analysis also contributed to "non-intervention" group before they were recognized as Age-Friendly, enhancing the baseline similarity in the groups. When displaying our results, we refer to time on the X-axis as time before and after facilities were Age-Friendly recognized (if they were) and calculate the change in facility-free days on the Y-axis from our model estimates. This Figure does display changes over time in facility-free days in all facilities (prior to intervention) and changes in Age-Friendly-recognized facilities compared to all other facilities (post-intervention), but is not intended to display any relevant data related to parallel pre-trends (only a single line is shown displaying changes in the outcome over time).

We also considered whether a negative binomial or Poisson model for the outcome as a "count" variable would provide additional insights. However, we found

the estimates, standard errors, beta-coefficients, and *p*-values to be indistinguishable (Table S1). The analysis was part of a larger operational/quality improvement project and was not considered human subjects research.

RESULTS

Overall, there were 50 VAMCs and 81 care areas within those medical centers that were recognized as Age-Friendly during the time period of interest. Of the 81 care areas, 60 received Level 1 recognition and 21 received Level 2. These care areas included 50 ambulatory care sites, 13 acute care sites, and 18 post-acute or long-term care sites.

In the overall results, there were statistically significant—but very small—associated increases in the number of facility-free days (0.2 percentage point increase in proportion of facility-free days, Figure 1 and Table 1). These results were principally driven by very small reductions in nursing home days among those who were not previously long-term nursing home care residents (0.1 percentage point decrease, Table 1, column 4). There was also an even smaller (0.02%) associated increase in Emergency Department days that was

statistically significant (Table 1, column 6). There were no differences in hospital days or in nursing home days among those who were already long-term residents.

Given the baseline proportion of facility-free days in the overall population was 97.0%, our overall finding can be interpreted as increasing the overall mean proportion of facility-free days to 97.2%, or adding 0.73 facility-free days annually to a baseline of 354 facility-free days. The results were similar in all pre-specified subgroups (Table 1 and Figures S2–S4) with effect sizes all <0.1 percentage points.

DISCUSSION

We found a small statistically significant associated increase in hospital and nursing home-free days following Age-Friendly recognition at VA sites. These results can be seen from two different perspectives. The first—at a population level—is that despite limitations in our analysis that might bias to the null, we found a statistically significant association that could be producing substantial cost savings and improved outcomes for Veterans. For example, we calculate there were 367,329
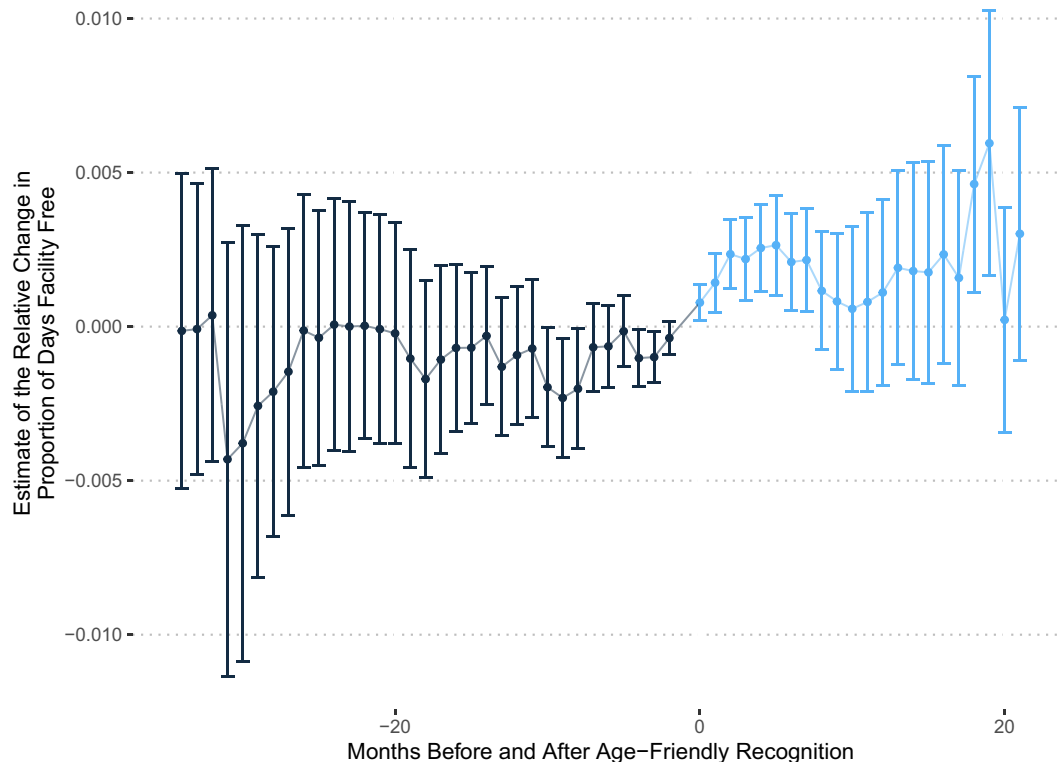

FIGURE 1 Change in facility-free days in Veterans treated at VA medical centers recognized as Age-Friendly. Estimates from a differences-in-differences model comparing days at home between individuals associated with an Age-Friendly site and those not associated with an Age-Friendly site. *Time* on the x-axis denotes the number of months from when the site was initially designated as Age-Friendly, while the *Y*-axis represents the estimate from the model of differences in facility-free days.

TABLE 1 Regression estimates from the difference-in-difference model.

	Facility-free days overall	Hospital days	Nursing home days	Nursing home days (non-residents)	Nursing home days (residents)	Emergency Department days
All						
Estimate	0.0018	−0.0009	−0.0009	−0.0009	−0.0001	0.0002
SE	(0.0008)	(0.0006)	(0.0003)	(0.0004)	(0.0002)	(0.000)
p-value	0.017	0.1463	0.0056	0.0298	0.7384	0.000
Mean	0.9698	0.021	0.0046	0.0028	0.00181	0.009
Lives close to VA						
Estimate	−0.0015	0.0008	0.0005	0.0003	0.0001	0.0002
SE	(0.0008)	(0.0007)	(0.0003)	(0.0002)	(0.0003)	(0.0001)
p-value	0.0679	0.3066	0.1855	0.0528	0.5833	0.0004
Mean	0.9547	0.0301	0.0094	0.0047	0.0047	0.0029
High HNHR score						
Estimate	0.0122	−0.0053	−0.0071	−0.0072	0.0001	0.0006
SE	(0.0128)	(0.0123)	(0.0039)	(0.0039)	(0.0001)	(0.0009)
p-value	0.3415	0.6691	0.0695	0.0664	0.285	0.5475
Mean	0.9039	0.0836	0.0035	0.0035	0.0001	0.0084
Tier 2 status						
Estimate	−0.001	0.0001	0.0014	0.0008	0.0006	0.000
SE	(0.0019)	(0.0011)	(0.0013)	(0.0006)	(0.0007)	(0.0001)
p-value	0.6269	0.9248	0.2677	0.185	0.3595	0.4932
Mean	0.9642	0.0243	0.0063	0.0032	0.0031	0.002

Note: Regression estimates showing the difference in the outcomes listed between individuals associated with an Age-Friendly site and those not associated with an Age-Friendly site. In the columns, nursing home days refers to changes in days spent in the nursing home in the overall cohort. The two columns to the right of this columndescribe changes in nursing home days among those who are and are not long-term nursing home residents, respectively. The top rows ("All") are for the overall cohort. The second set of rows ("Lives Close to VA") are for those who live within 10 miles of a VA facility. The third set of rows ("High HNHR score") are for "High Needs High Risk" (HNHR) Veterans. The final rows("Tier 2 Status") are a comparison of second-level Age-Friendly recognition (compared to sites that have not achieved second-level Age-Friendly recognition).
Abbreviation: SE, standard error.

Veterans who received inpatient care at one of the sites recognized as Age-Friendly during the study period. An average cost per inpatient hospital day in the VA is $4782; saving 0.73 hospital days per patient would be $1.28 billion in savings (367,329 × 0.73 × $4782) if these facilities had been Age-Friendly over the entire time period. This is a very rough approximation since it is not a direct measurement of the number of hospital days in either group, does not incorporate the variable amount of time facilities were recognized as Age-Friendly, nor were we able to capture specific units (such as inpatient) that were recognized as Age-Friendly. However, it demonstrates the magnitude of potential cost savings from reductions in facility days across a large population as could occur with Age-Friendly recognition.

A second perspective- at the individual level - is that we found a statistically significant but unlikely clinically meaningful association. Given our sample averaged 97% of days at home, adding another 0.2% may not be seen as meaningful, although a clinically meaningful difference is not yet defined for home days and is an important area for future research. Other statistically significant findings—such as a 0.02% increase in Emergency Department days—are of even more uncertain clinical significance. In this perspective, our findings may be statistically spurious despite our attempts to rigorously compare Age-Friendly-recognized to non-Age-Friendly recognized facilities, and could represent a large amount of work to change care practices for a modest change in outcomes. In addition, others have found that reduced inpatient hospital days were not linked to improved subsequent quality of life.[13] There are several potential explanations for the small magnitude of our findings.

First, the vast majority of sites had received Level 1 recognition, which means they had an IHI-approved plan for implementing 4Ms care processes and were early in

the implementation process. It is possible that more "mature" 4Ms implementation will demonstrate a stronger signal of improved clinical outcomes. By the end of our analytic period, 50 of the 171 VAMCs had received Age-Friendly recognition, but this proportion continues to increase and future work can re-evaluate the magnitude of effects as recognition scales further across facilities.

Second, our analysis may be biased toward not demonstrating an effect because of limitations in the data available. For most quality improvement interventions, issues of reach, "dose" (or intensity), and duration of intervention play key roles in modifying outcomes. We compared medical centers overall (in the spirit of IHI recognition and in the spirit of the AFHS model, which supports expansion to all care areas) but may find stronger effects in subgroups of Veterans we can identify as clearly exposed or not exposed to the intervention. At the time of the analysis, it was not possible to identify specific care areas recognized as Age-Friendly, nor specific Veterans who received 4Ms care, what type of 4Ms care was received, nor how frequently they received 4Ms care. In other words, our results often reflect only one care area in an entire medical center being recognized as "Age-Friendly," which could wash out any signal. This is a significant limitation of our analysis, but is consistent with the way IHI recognizes facilities as Age-Friendly for pragmatic reasons. Even if we could identify which care area(s) was recognized as Age-Friendly, calculating a "dose" of exposure would require comprehensively identifying every health care encounter for every Veteran, which was not feasible in the current analysis. Similarly, it is unknown how to "weight" these different encounters. For example, if a Veteran visits an Age-Friendly recognized Emergency Department, should this "count" more than seeing an Age-Friendly recognized geriatric primary care clinic? Or a non-Age-Friendly-recognized medical specialist?

Third, being recognized as "Age-Friendly" may not mean there was a meaningful change in care practices.[14] This would bias our findings to the null and could have mitigated a larger effect. However, sites that were recognized as Age-Friendly had qualitatively lower rates of facility-free days throughout the pre-period than sites that did not pursue Age-Friendly recognition during our time period of interest (Figure S1). These differences are small, but support the idea that sites pursuing Age-Friendly recognition did not start from a place of higher performance than sites who were not recognized, and that potentially meaningful changes in care practice occurred to reverse this trend in the post-period. In addition, our findings could be due to chance related to testing multiple outcomes in different populations. Our results may only be applicable only to Veterans inside the VA context and may not be generalizable to other patients and care settings.

Fourth, little is known about the heterogeneity of 4Ms implementation across different contexts in the Age-Friendly movement overall. IHI provides guidance on specific assessments and interventions recommended in different care settings, but sites can choose within these lists. We did not have access to all of the approved "Age-Friendly" plans submitted for recognition by the care settings represented in this study. Review of such plans by individual VA sites might allow more insight into which practices might be associated with larger improvements in clinical outcomes. Further, there is little evidence to guide sites in choosing Age-Friendly interventions most likely to improve outcomes in older adults, nor how best to implement them—an important operational and research area to investigate further.[14] In addition, there may be Veterans for whom Age-Friendly care transformation is particularly impactful, and others for whom it does not meaningfully change outcomes. If this were the case, an overall mean change might miss subgroups who particularly benefit, and identifying and reaching these groups could be an important part of future work.

Fifth, it is unclear to what extent facility-free days as a metric is responsive to Age-Friendly transformation. In the overall sample, surprisingly, 97% of days were facility-free, providing little room to demonstrate significant impacts. While facility-free days represent a Veteran-centric outcome that is aligned with VHA priorities, it requires interventions that would plausibly reduce outcomes such as hospitalizations, emergency department visits, and nursing home stays. The Age-Friendly care practices suggested for initial recognition as Age-Friendly—and likely adopted by many VA sites evaluated—may not "move the needle" sufficiently on utilization outcomes. These practices are focused on process measures and may not represent interventions most likely to influence care utilization.[5] As sites progress in their implementation efforts, they may increase their capacity to adopt evidence-based practices that demonstrate effectiveness in reducing utilization.

In addition to the limitations noted above, strengths of this analysis include comprehensive identification of all VA-enrolled Veterans, care sites and their timing of recognition, and all utilization data for hospitalizations, Emergency Department days, and institutional post-acute care and long-term care days using the VA RHF and VA community care data. In addition, we have developed a consensus "facility-free days" metric using these data sources that can be used for future evaluations.

There is persistent evidence of quality and safety concerns in the health care of older adults, and the US population is growing proportionally older.[1] The AFHS model has achieved widespread adoption and represents one of the largest opportunities to reorganize and improve care

practices for older adults. Future evaluations such as this one should focus on how best to implement this care model to "move the needle" on outcomes across care settings.

AUTHOR CONTRIBUTIONS

FUNDING INFORMATION

CONFLICT OF INTEREST STATEMENT

SPONSOR'S ROLE

ORCID

Robert E. Burke https://orcid.org/0000-0002-9521-8699

TWITTER

Robert E. Burke *BBurkeMD*

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supplementary Material. Additional figures and tables analyzing changes in the overall cohort.
Figure S1. Mean facility-free days over the study period in sites that were never recognized as Age-Friendly versus sites that eventually were recognized as Age-Friendly.
Table S1. Regression estimates comparing ordinary least squares, negative binominal, and Poisson models.
Figure S2. Change in facility-free days in Veteran subgroup at highest risk of nursing home entry.
Figure S3. Change in facility-free days in Veterans who live within 10 miles of a VA medical center.
Figure S4. Change in facility-free days in VA sites achieving Tier 2 Age-Friendly recognition.