

Implementing GRACE Team Care in a Veterans Affairs Medical Center: Lessons
Learned and Impacts Observed

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ABSTRACT:

In a randomized clinical trial, Geriatric Resources for Assessment and Care of Elders (GRACE) improved care quality and reduced acute care utilization for high-risk, low-income seniors. To assess the impact of GRACE at a Veterans Affairs Medical Center (VAMC), veterans aged 65 or older from Marion County, Indiana with primary care providers (PCPs) from 4 of 5 VAMC clinics and who were not on hospice or dialysis were enrolled into GRACE following discharge home from an acute hospitalization. After an initial home-based transition visit to the GRACE enrollees, the GRACE Team returned to conduct a geriatric assessment. Guided by 12 protocols and input from an interdisciplinary panel and the PCP, the GRACE Team developed and implemented a veteran-centric care plan. Hospitalized veterans from the fifth clinic, who otherwise met enrollment criteria, served as a “usual care” Comparison group. Demographic, comorbidity, and utilization data were drawn from VA databases. The GRACE and Comparison groups were similar in age, sex, and burden of comorbidity, though predicted risk for 1-year mortality in GRACE veterans was higher. Even so, GRACE enrollment was associated with a 7.1% reduction in Emergency Department visits, 14.8% fewer 30-day readmissions, 37.9% reduction in hospital admissions, and 28.5% decreased total bed days of care, saving VAMC an estimated \$200K/year over and above program costs during the study for the 179 veterans enrolled in GRACE. Having engaged, enthusiastic VA leadership and GRACE staff; aligning closely with the medical home; and accommodating patient acuity were among the important lessons learned during implementation.

Key words: interdisciplinary team care, care management, care utilization

INTRODUCTION:

In 2011, approximately nine million US veterans were over the age of 65 years¹. Between 2000 and 2012, the number of veterans aged 85 and older tripled. While the total US veteran population decreased by 17% between 2001 and 2014, the number of veterans who accessed their Veterans Health Administration (VHA) benefits actually increased by 78% during those years², with male veterans over the age of 75 being more likely to use their benefits than younger veterans³.

Older veterans who utilize VHA resources have higher rates of functional impairment and cognitive impairment than age-matched nonveterans or age-matched veterans not accessing VHA care. In addition, these veterans often have high levels of multimorbidity⁴. These underlying impairments and comorbid conditions can lead to complex treatment regimens that are challenging and may require the veteran to see myriad providers and subspecialists, sometimes across multiple VA and non-VA settings. This complexity of care and the frequent transitions it involves increase the risk for adverse events in addition to being burdensome to the veteran and caregiver.

Adequately addressing the needs of these complex older veterans requires use of both innovative models of medical care and input from providers with geriatric training. However, because much of the current VHA workforce has little training or expertise in geriatrics⁴, these new models of care must also efficiently leverage what geriatric expertise is available to benefit as many veterans as possible.

GRACE (Geriatric Resources for Assessment and Care of Elders) Team Care™ is a model of care that works in collaboration with primary care and the patient-centered medical home to provide home-based geriatric care management focusing on geriatric syndromes and psychosocial issues commonly found in older adults⁵. In a previous

randomized controlled trial in low-income seniors, GRACE showed improved quality of geriatric care for all older adults while decreasing acute care utilization among those older adults at high risk for hospitalization⁶.

We hypothesized that implementing a GRACE program in a high-risk VHA population would result in decreased acute care utilization and reduced costs to the VAMC. This article describes the lessons learned and outcomes observed during a practical clinical trial involving the implementation of GRACE at the R. L. Roudebush Veterans Affairs Medical Center (Indianapolis VAMC) in Indianapolis, Indiana.

METHODS:

Population:

In 2009 approximately 15,000 veterans age 65 or older accessed primary care at the Indianapolis VAMC and accounted for 4500 emergency department visits and 2700 hospital admissions. An estimated 2000 of these older veterans already required assistance in one or more activities of daily living, and over 300 carried a formal diagnosis of dementia, a number which likely reflects significant under-reporting of disease in this population. In 2009, Geriatric clinical services at Indianapolis VAMC were limited, consisting of three half-day-sessions of a Geriatric Primary Care Clinic housed within one of the general primary care clinics and a small outpatient Older Adult Mental Health Clinic within the psychiatry department. Home health care support (through VA Homecare or purchased through outside home health agencies), purchased adult daycare, and purchased nursing home care were also available to eligible veterans. Thus, the majority of older veterans at the Indianapolis VAMC received most of their clinical care from VA-employed PCPs who had little geriatric training. Within the VAMC, all inpatient and outpatient care is documented using the VA's electronic medical record (Computerized Patient Record System, CPRS) including all progress notes, discharge summaries, medication and test orders, test results, appointments, and billing codes.

Implementation, Recruitment, and Key components of GRACE:

In April 2010, physician leaders of the five on-site primary care clinics at Indianapolis VAMC were approached about participating in the GRACE program, and four of the five clinics (involving 29 primary care providers) agreed to take part. Of note, the clinic that elected not to participate (involving 11 primary care providers) was the

site of the existing Geriatric primary care clinic sessions and also served as a training site for 26 internal medicine residents from Indiana University School of Medicine.

After gaining buy-in for the project from Indianapolis VAMC leadership and the various PCPs of the four participating clinics, a geriatrician (CCS) began conducting focused chart reviews of hospitalized veterans who met the following eligibility criteria: age 65 or older; live at home or in assisted living within Marion County, IN; enrolled in primary care at Indianapolis VAMC; not on dialysis; and life expectancy of at least 6 months. The chart reviews looked for evidence of geriatric syndromes, such as delirium, cognitive impairment, frailty, multimorbidity, polypharmacy, and difficulty walking/falls, characteristics that generally indicate the individual may be at high risk for functional decline and other adverse outcomes such as frequent hospitalizations. Eligible veterans receiving primary care from one of the four participating clinics, who were discharged home after the hospitalization, and who agreed to participate, were scheduled for a home visit for GRACE enrollment (Figure 1). Veterans from the fifth primary care clinic that was not participating in the program but who otherwise met enrollment criteria, including evidence of geriatric syndromes on chart review, served as the Comparison group.

Eligible GRACE veterans were contacted promptly following hospital discharge (index hospitalization) to schedule an in-home post-hospital transition visit within 7 days. The initial visit was conducted by the nurse practitioner and social worker (“the GRACE team”) and focused on building rapport between the veteran and the GRACE team while addressing post-discharge concerns such as medication reconciliation and ensuring appropriate clinic follow-up. The GRACE team then returned to the home 3-4 weeks later to conduct a comprehensive geriatric assessment (GRACE visit). Following

each of these visits, the nurse practitioner and social worker presented and discussed the case in the weekly GRACE interdisciplinary team meeting, which included a geriatrician, pharmacist, and psychologist/mental health liaison. During the interdisciplinary meeting following the GRACE visit, the team utilized the twelve GRACE protocols⁵ to develop a veteran-centric care plan that addressed the geriatric issues found during the comprehensive assessment. The GRACE team then collaborated with the PCP and the veteran to review, modify, and implement this care plan in a way consistent with the veteran's goals of care. Thereafter, the GRACE team continued to participate in the veteran's care collaboratively through monthly and as needed follow-up visits, either face-to-face or via telephone as clinically indicated.

Data and Statistical Analyses:

For both GRACE and Comparison veterans whose index hospitalization occurred between April 1, 2010 and July 31, 2011, data on demographics, multimorbidity, and acute care utilization in the 1-year prior to and following the index hospitalization were drawn from VHA databases following IRB approval. Veterans without at least 12 months of medical care at the Indianapolis VAMC prior to the index hospitalization were excluded from the data analyses.

To calculate burden of comorbidity, the primary and secondary inpatient diagnoses in the 1-year period prior to index hospitalization were entered into the Romano-Dartmouth-Manitoba Enhanced ICD-9 version of the Charlson Comorbidity Index^{7,8}; the higher the score, the higher the risk for mortality and healthcare resource use. Prognostic information for 1-year mortality for both groups was also obtained by inputting the primary and secondary inpatient diagnoses from the 1-year period prior to

index hospitalization, age at index hospitalization, and length of stay into the Levine Prognosis Index⁹.

To calculate the rate of 30-day readmissions for acute hospitalizations that occurred within the study period in the two groups, the denominator was the total number of acute-care hospital admissions, including the index hospitalization, and the numerator was the number of those hospitalizations that had a readmission within 30 days. Hospitalizations for “nonacute care” (e.g., psychiatry, 23-hour observation, rehabilitation) were excluded. Bed days of care were counted as the number of midnights in the hospital, and the number of ED visits included both those associated with and not associated with a hospital admission. Utilization data for both groups was followed for 1-year after discharge from the index hospitalization or until death, whichever occurred first.

To calculate projected post-index ED visits, admissions, readmissions, and bed days of care for the GRACE group, the ratio of the Comparison group’s post-index utilization to its pre-index utilization was multiplied by the GRACE pre-index utilization. The difference between the actual GRACE utilization of each type and the projected GRACE utilization of each type was calculated to determine how many acute care visits were potentially “avoided” by having the veterans enrolled in GRACE.

To estimate mean acute care costs, hospitalization data from a convenience sample of the 199 veterans who were actively enrolled in VA GRACE between October 2011 and July 2012 was used to calculate the average cost of a GRACE veteran hospitalization. This group accounted for 284 hospital stays with a total cost (by Diagnosis Related Group) of \$3,267,590, making the average cost per hospitalization of a GRACE veteran \$11,506. This mean cost was then multiplied by the number of

“avoided” hospitalizations for the GRACE group to reflect cost savings from acute hospitalizations.

Chi-square analysis and student t-tests were used to compare differences in demographic and clinical variables between veterans enrolled in GRACE and those in the Comparison group. The number of hospital admissions, bed days of care and number of ED visits are reported in terms of person-years since some veterans died before the end of the 1-year follow-up period (in GRACE group, 17 deaths; in Comparison group, 15 deaths). To calculate change in utilization rates over time between veterans enrolled in GRACE and those in the Comparison group, we used the difference-in-differences approach, which subtracts the change over time in the Comparison group from the change over time in the GRACE group. Thus, a negative value for difference-in-differences in this study indicates a reduction in acute care utilization. The change in time for the GRACE group was calculated as its mean utilization rate over the year post-enrollment minus its mean utilization rate over the year prior to enrollment (baseline). Likewise, the change over time for the Comparison group was calculated as its utilization mean for the year post-index hospitalization minus its mean utilization baseline. The difference-in-differences estimate is then determined by subtracting the Comparison difference from the GRACE difference. All analyses were conducted with SAS version 9.2 (SAS Institute, Cary, NC).

RESULTS:

Patient and Intervention Characteristics:

The baseline characteristics of the veterans enrolled in GRACE (n=179) and in the Comparison group (n=77) between April 2010 and July 2011 are summarized in Table 1. At time of enrollment, GRACE Charlson Comorbidity Index scores were higher than the Comparison group, though this did not reach statistical significance, and GRACE veterans had significantly worse 1-year prognosis as measured via the Levine Prognosis Index ($p < 0.001$).

Following the comprehensive geriatric assessment (GRACE visit) and interdisciplinary team rounds, veterans receiving GRACE triggered an average of 4.9 GRACE protocols per patient. Each GRACE protocol was activated with the following frequency: medication management (160/179, 89%), advanced care planning (153/179, 85%), health maintenance (148/179, 83%), difficulty walking/falls (140/179, 78%), depression (84/179, 47%), urinary incontinence (50/179, 28%), dementia (42/179, 23%), caregiver burden (29/179, 16%), malnutrition and weight loss (24/179, 13%), hearing Impairment (20/179, 11%), chronic pain (16/179, 9%), and visual impairment (10/179, 6%). Interventions that the GRACE Team frequently implemented included simplifying medication regimens, arranging for in-home nursing medication assistance, consulting physical therapy, obtaining needed durable medical equipment for the home, starting or adjusting an antidepressant, and addressing caregiver stress and burden.

During the study period, the GRACE team performed 227 in-home post-hospitalization transition visits, 210 in-home comprehensive geriatric assessment visits, and 347 face-to-face follow-up visits with the veterans enrolled in the GRACE program. GRACE provided additional support and case management by telephone, with the

nurse practitioners documenting 241 telephone contacts and the social workers 457 telephone contacts during that time.

System Outcomes:

Healthcare resource utilization for the GRACE and Comparison groups from one year prior to the index hospitalization through 1-year after is presented in Table 2. Calculations using the difference-in-differences method revealed that enrollment in GRACE was associated with a 7.1% decrease in ED visits ($p=0.59$), a 14.8% reduction in 30-day readmissions ($p=0.19$), a 37.9% reduction in total hospitalizations ($p=0.14$), and a 28.5% decrease in total bed days of care ($p=0.01$) (Figure 2) per 100 veterans enrolled per year.

Costs and Savings of the program:

During the study, the GRACE program consisted of 2.0 FTE nurse practitioners, 2.0 FTE social workers, and 1.0 FTE program support assistant. In addition, the interdisciplinary team included a pharmacist (0.1 FTE), a psychologist (0.1 FTE), and a geriatrician (0.125 FTE). When operating at full capacity, each GRACE NP/SW dyad could manage a panel of about 100 veterans, or 200 veterans total for a GRACE program of this staffing size. Including salary and benefits, vehicles and mileage for home visits, continuing medical education, and miscellaneous supplies, the annual total cost of the GRACE program was \$545,105 in 2010.

Our outcomes data shows that the 179 GRACE veterans in the study avoided 15 admissions and 53 readmissions in the year after enrollment in the program. (Figure 2). At an average cost per admission of \$11,506, we thus estimated that GRACE helped our VAMC avoid acute care costs totaling \$782,408 in that first year, saving our VA an estimated \$237,303 over and above the costs of the GRACE program.

DISCUSSION:

This practical clinical trial supports the feasibility of implementing GRACE within a VAMC setting and speaks to its potential to positively impact outcomes for both older veterans and for the VAMC. As would generally be expected in an aging group of veterans with high burden of comorbidity, the Comparison group had increased rates of readmission and bed days of care during this study compared to the year prior. Enrollment in GRACE, on the other hand, was associated with a marked reduction in all measures of acute care utilization in the following year in spite of the GRACE veterans having similar comorbid burden and worse prognosis than the Comparison group.

Another in-home model of geriatric care within VA is Home Based Primary Care (HBPC),¹¹ which has also shown success at reducing hospital bed days of care, 30 day readmissions, and overall costs.¹² Though GRACE and HBPC both utilize interdisciplinary teams to care for patients with complex, chronic medical and psychosocial comorbidity, HBPC is different in that it specifically focuses on those veterans for whom routine office-based care is not effective and then delivers their primary care in the home. Since HBPC was implemented at the Indianapolis VAMC in October 2014, it has been our experience that having both GRACE and HBPC offers an excellent continuum of geriatric care for our VA's veterans, with GRACE focusing on the complex older veterans who can still be seen within the outpatient clinics and HBPC assuming primary care for those for whom access to clinic is exceedingly difficult.

Lessons Learned: factors for success

Factors that contributed to the success of GRACE included the following: early engagement of an invested, supportive leadership who were provided with regular updates on the program's progress and positive impact; recruitment of energetic

GRACE team staff with experience in Geriatrics and interdisciplinary team care; and the natural alignment of the concepts behind GRACE with the VA's implementation of the medical home (called Patient Aligned Care Team, or PACT), which was in its preliminary stages during the time of this study. Early demonstration of the positive impact of GRACE on 30-day readmissions following the index hospitalizations (GRACE index readmission rate 17/179 [9.5%] vs. Comparison index readmission rate 12/77 [15.6%], $p=0.16$) was vital to building early support for the program with hospital administration during its implementation.

Lessons Learned: barriers and solutions

The program also faced some special challenges. First, in the initial phases of implementation, some PCPs were skeptical of the program's potential and were concerned that having to discuss the GRACE care plans with the GRACE team would be time consuming and burdensome. However, after experiencing the benefits of GRACE involvement in their complex veterans' care, PCPs began to embrace the program with enthusiasm. Second, because the program decided to devote its efforts exclusively to high-risk, complex veterans, the home visits, especially the post-hospital-discharge transitional ones, were found to be more time and effort intensive for the GRACE staff than in the original GRACE trial. To accommodate this, the program had to slow its enrollment rate below what was initially anticipated (see Figure 1, "Team at Capacity"), which unfortunately limited the pace of program growth during implementation. A third challenge occurred when incorporating the GRACE protocols and progress note templates into the VA's electronic medical record, as this was more complicated and time-consuming than expected. Finally, GRACE needed to provide

ongoing clarification to Indianapolis VAMC providers and staff of the distinctions between GRACE and our VA's Homecare program.

Limitations:

This study has several limitations. Because this is a practical clinical trial, our GRACE and Comparison groups had some differences that may have impacted the results. For example, the Comparison group actually appeared less chronically ill than the GRACE veterans at enrollment, though this fact would actually strengthen the argument that GRACE had a positive impact on acute care utilization outcomes. Additionally, the Comparison group included veterans who received some of their primary care from internal medicine residents rather than only from attending VA PCPs, which could possibly contribute to increased acute care utilization. On the other hand, the clinical site from which the Comparison group was drawn also included the Geriatric Primary Care Clinic. While the veterans served in this Clinic are generally more frail and medically complex than usual primary care, the comprehensive and proactive structure of Geriatric Primary Care is designed to reduce risk of adverse outcomes such as hospitalization. Thus, the presence of the Geriatric Primary Care Clinic in the Comparison site could also weigh in favor of stronger GRACE impact.

We were surprised when 20.8% (89 of the 428 eligible) of veterans who were offered GRACE enrollment refused. When possible, these veterans were asked their reason for declining. The most common explanation given was that the veteran and/or family was uncomfortable having staff visit in the home. The second most frequent reason for refusal was the veteran wanted to conserve the program's resources for other veterans who were in greater need than (s)he. Further study will be required to understand the impact of this rate of refusal.

Another limitation is that we only have one year of follow-up data. However, in the original GRACE trial^{5,10}, hospitalization rates and costs were reduced even further in the second year of the study, so this limitation likely results in bias against GRACE rather than for it. Additionally, our cost savings calculation is likely conservative since the average cost of hospitalization was calculated using GRACE veterans' hospitalizations, whose bed days of care decreased during the study while the Comparison groups' increased. Again, though, this likely bias strengthens the argument in favor of GRACE's impact.

This program was implemented in a VAMC located at an academic medical center in an urban area, so the results may not be generalizable to all medical centers, all Veteran's hospitals, to all populations of older adults, or even to all older veterans. Also, our outcomes include only VA utilization data from our VA facility and thus will have missed any non-VA acute care visits and their costs, as well any acute care at other VA facilities.

Finally, this study only examines acute care utilization and thus does not account for all costs of care for these two groups of veterans. Of note, in cost analyses conducted for the original GRACE clinical trial¹⁰, for the intervention patients in the "high risk" group (the group most similar to those in our study), only rehabilitation and mental health services were of significantly higher cost compared to usual care, and reductions in acute care costs substantially offset this increase.

CONCLUSION:

GRACE Team Care, an evidence-based, innovative model of geriatric care management, can be successfully implemented within a VAMC, is associated with

decreased acute care utilization in high-risk older veterans, and has the potential to contribute to overall cost savings in the care of this population.

Acknowledgments:

Conflict of Interest Checklist:

Elements of Financial/Personal Conflicts	*Author 1 Cathy Schubert		Author 2 Laura Myers		Author 3 Katie Allen		Author 4 Steven Counsell	
	Yes	No	Yes	No	Yes	No	Yes	No
Employment or Affiliation	X		X			X	X	
Grants/Funds	X		X			X	X	
Honoraria		X		X		X	X	
Speaker Forum		X		X		X		X
Consultant		X		X		X	X	
Stocks		X		X		X		X
Royalties		X		X		X		X
Expert Testimony		X		X		X		X

Board Member		X		X		X	X	
Patents		X		X		X		X
Personal Relationship		X		X		X		X

***Authors can be listed by abbreviations of their names**

For “yes”, provide a brief explanation:

CS is employed by the Department of Veterans Affairs and received salary support from VA grant funding during this GRACE implementation project.

LM is employed by the Department of Veterans Affairs and receives grant funding from the same.

SC has been awarded grant funding for GRACE model replication including provision of training and technical assistance. In addition, he has received honoraria for speaking to various academic and commercial audiences about the GRACE model. Dr. Counsell serves as President and Board Member of the American Geriatrics Society.

Author Contributions:

Drs. Schubert and Counsell: conception and implementation of the GRACE program; study design, analysis and interpretation of the data, and preparation of the manuscript.

Dr. Myers: analysis and interpretation of the data; preparation of the manuscript. Ms.

Allen: interpretation of the data; preparation of the manuscript.

Sponsor's Role:

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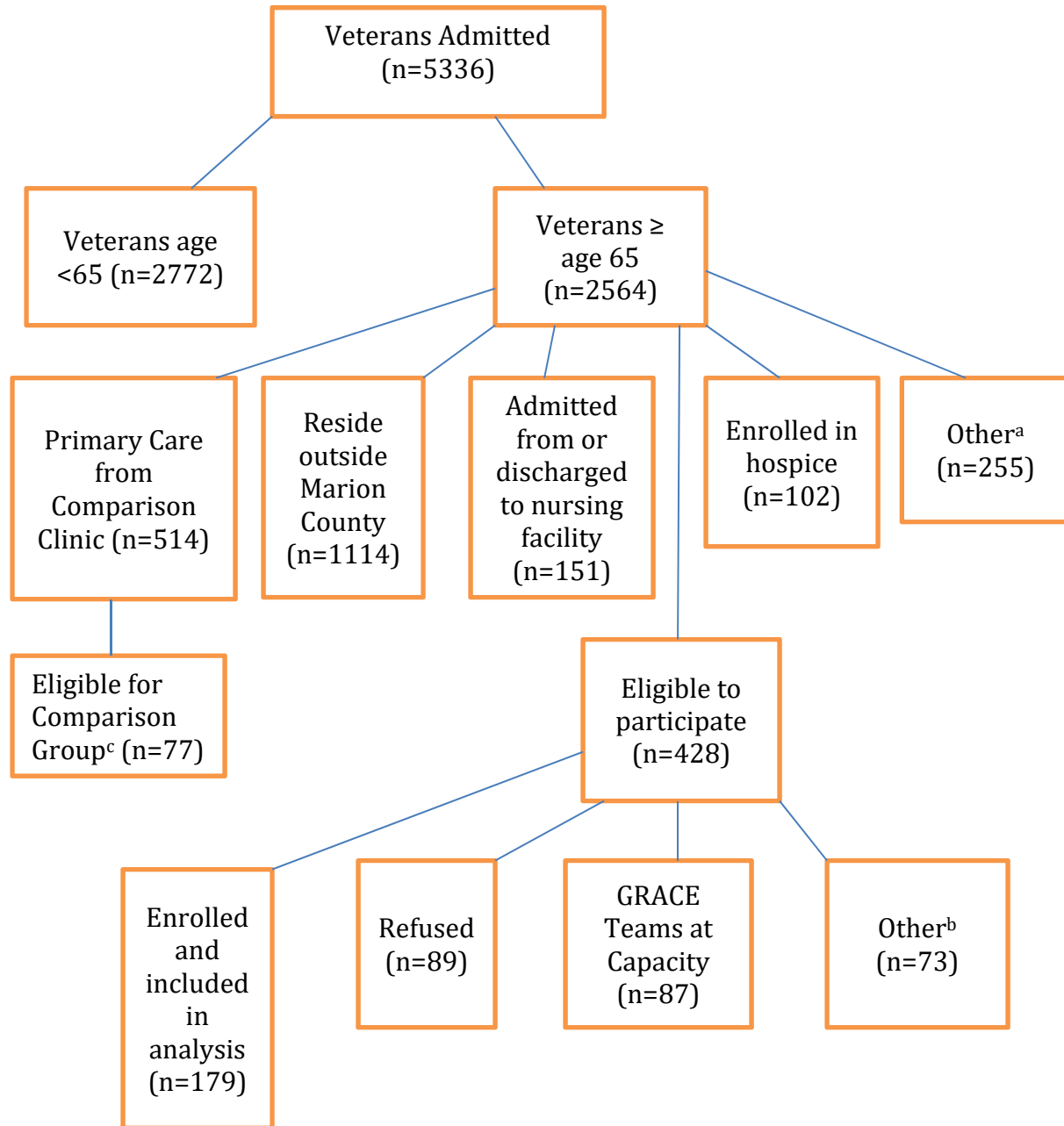
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GRAPHICS:

Figure 1: Patient Enrollment in GRACE at a Veterans Affairs Medical Center, April 2010 through July 2011



- a. On chart review, these veterans were ineligible for reasons such as ESRD, homelessness, lack of a VA PCP, life expectancy < 6 months but not in hospice, or highly functional/no evidence of geriatric syndromes.
- b. Includes veterans who were not enrolled due to inability of study personnel to contact veteran to schedule a home visit, who moved outside of Marion County after index hospitalization, or who had less than 1 year of pre-index data.

- c. Remaining 437 veterans were ineligible for inclusion in the Comparison Group because they lived outside Marion County, were admitted from/discharged to a nursing facility, were in hospice, or other as in footnote a.

Table 1: Demographics of Patients Enrolled in GRACE Versus the Comparison Group in a Veterans Affairs Medical Center

Variable	GRACE (n=179)	Comparison (n=77)	P-value
Age, years – mean (range)	78 (65-97)	77 (65-93)	0.31
Men – number (%)	174 (97%)	72 (94%)	0.17
Duration of Follow-up, Person-Years – Mean (Range)	0.95 (0.03-1.00)	0.87 (0.03-1.00)	0.04
CCI Score – Mean (Range)	2.81 (0-14)	2.55 (0-11)	0.40
LPI Score – Mean (Range)	2.89 (0-8)	1.91 (0-5)	<0.001

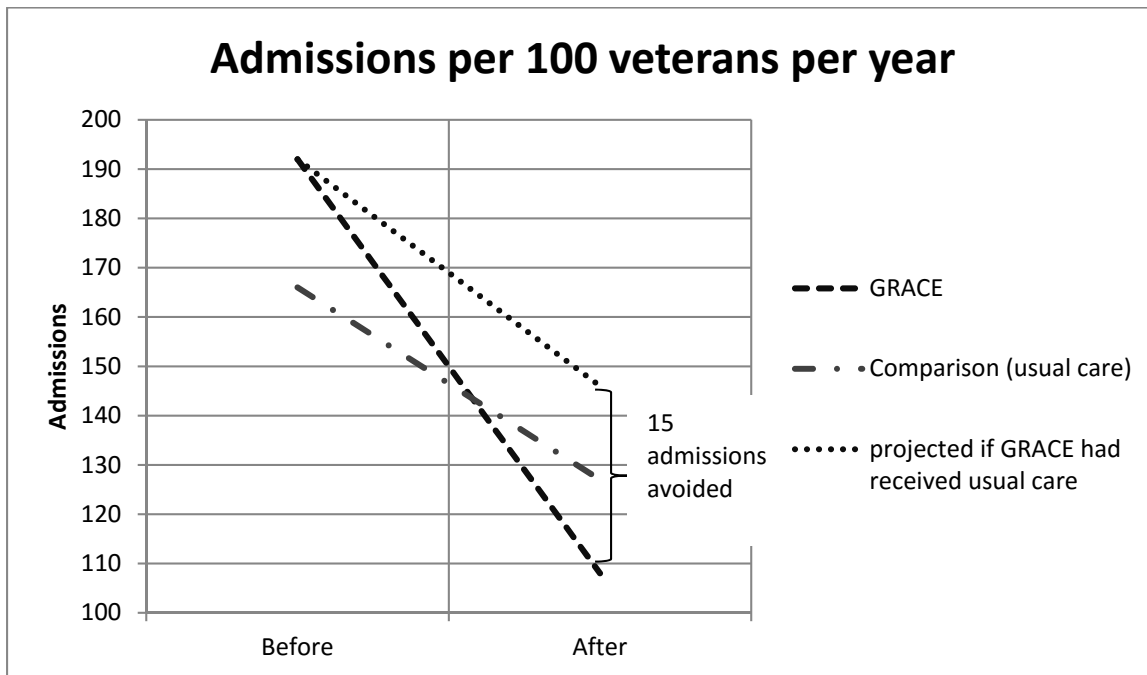
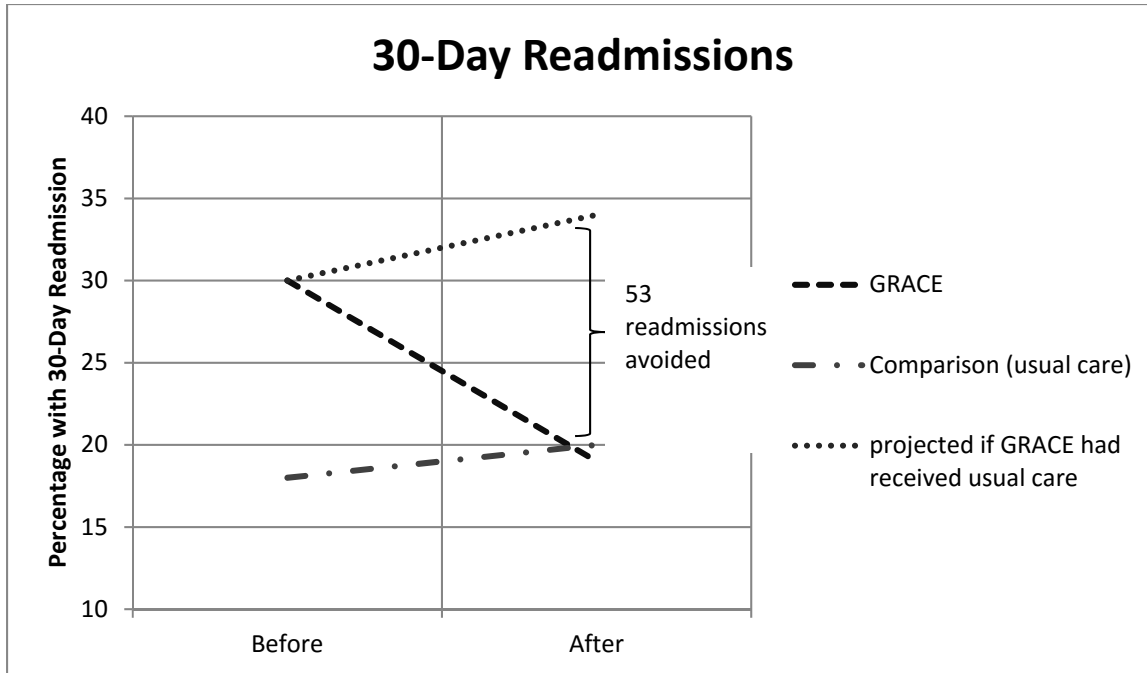
CCI = Charlson Comorbidity Index, range 0-≥5; LPI = Levine Prognosis Index, range 0-≥4

Table 2: Outcomes of Patients Enrolled in GRACE Versus the Comparison Group at a Veterans Affairs Medical Center

Variable	GRACE (n=179)		Comparison (n=77)		Difference -in- difference	P- value
	12 Months before	12 Months After	12 Months before	12 Months After		
30-day Readmissions- All [percent] (95% CI)	49/166 [29.5%]	69/360 [19.2%]	9/51 [17.6%]	33/162 [20.4%]	-13.1 (-36.4 to 10.2)	0.19
Admissions/100 veterans/year (95% CI)	191.6 (172.4- 213.0)	107.9 (93.3- 124.7)	166.2 (139.8- 197.7)	126.5 (102.2- 156.4)	-44.1 (-110.7 to 22.5)	0.14
Bed Days/100 veterans/year (95% CI)	756.4 (717.2- 797.8)	668.5 (630.7- 708.6)	564.9 (514.3- 620.6)	697.8 (637.4- 763.9)	-221.4 (-362.7 to -80.1)	0.01
ED Visits/100 veterans/year (95% CI)	273.7 (250.6- 299.1)	252.9 (230.1- 278.0)	284.4 (249.1- 324.7)	282.7 (245.2- 325.9)	-19.4 (-111.2 to 72.4)	0.59

CI = confidence interval; ED = Emergency Department

Figure 2: Outcomes of Patients Enrolled in GRACE Versus the Comparison Group at a Veterans Affairs Medical Center



Bed Days of Care (BDOC) per 100 veterans per year

