Protocol

1. Project Title: Utilizing the RESCUE Stroke Caregiver Website to Enhance Discharge Planning

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3. Abstract: Caregiver depression is common following a family member's stroke and is a major contributor of survivors' hospital readmission and institutionalization. Our long-term goal is to implement stroke caregiver programs that involve low-cost interventions that are sustainable in routine clinical practice. Our immediate objective is to test, using a randomized controlled trial, a problem-solving intervention for stroke caregivers that can be delivered over the phone followed by online, in-home sessions. We will modify the traditional problem-solving intervention by adding web-based training using interactive modules, factsheets, and tools on our previously developed and nationally available RESCUE Caregiver website (**http://www.cidrr8.research.va.gov/rescue/**). We will also provide online skills training and application of the problem-solving approach via the RESCUE messaging center, a secure site behind the VA firewall. This work builds on the team's extensive experience in stroke caregiver education.

Our immediate, primary aim (#1) is to test the effect of the intervention on stroke caregivers' depressive symptoms at approximately 11 and 19 weeks after baseline data collection. Primary Hypothesis: Stroke caregivers who receive the intervention will have less depressive symptoms compared to stroke caregivers in usual care. We propose **four secondary aims.** Aim #2 is to test the effect of the intervention on stroke caregivers' knowledge, perceived stress, burden, perceptions of positive aspects of caregiving, self-efficacy, health-related quality of life (HRQOL), and satisfaction with care at approximately 11 and 19 weeks after baseline data collection. Aim #3 is to test the effect of the intervention on Veterans' outcomes: functional abilities and healthcare utilization (i.e., unintended hospital bed days of care, number of emergency room visits, number of unscheduled clinic visits) at approximately 11 and 19 weeks after baseline data collection. Aim #4 is to determine the budgetary impact for implementing the intervention. Aim #5 is to determine the facilitators, barriers, and best practices for implementing the intervention.

Methods: We will conduct a two-group randomized controlled trial with repeated measures and use mixed methods to determine caregivers' perceptions of the intervention. We will enroll 240 stroke caregivers from 8 VA sites (North Florida/South Georgia Veterans Healthcare System, Miami VA Healthcare System, James A. Haley Veterans Hospital in Tampa, Michael E. Debakey VAMC in Houston, Hunter Holmes McGuire VAMC in Richmond, Central Arkansas Veterans Healthcare System, VA Tennessee Valley Healthcare System, and the VA Boston Healthcare System). Eligible caregivers will be interviewed, complete baseline measures, and then be randomized to two groups: 1) intervention group or 2) usual care group. A study team member will telephone caregivers at approximately 11 and 19 weeks after baseline to answer questions on instruments with established reliability and validity. The staff member will review the Veterans' VA Computerized Patient Record System health record to obtain information on the Veterans' healthcare utilization. We will determine the budgetary impact of the intervention by examining the cost data in the VA Managerial Cost Accounting System (MCAS) (formerly DSS) National Data Extracts (NDE) and Non-VA Medical Care files. Qualitative interviews will be conducted with selected caregivers to obtain in-depth perceptions of the value, facilitators, and barriers of the intervention. Throughout all phases of the project, we will collaborate with our VA partners (Office of Nursing Services, Office of Geriatrics and Extended Care).

Impact: This is the first known study to test a transition to home intervention combined with technology to improve the quality of caregiving and the recovery of Veterans. Other outcomes will be a state-of-the-art website and an evidence-based model (telephone, transition to home and online, training and caregiver-provider messaging) that can be transportable to other disease models.

4. Background: The overarching theoretical model guiding our study is the health communication process model. This model has the following stages: planning and strategy development; development and pretesting concepts, messages, and materials; implementation; assessment of effectiveness; and feedback to the first stage. Within each stage there is an ongoing, synergist feedback loop between planning, implementation, and improvement (see graphic). A key component of this model is improving the health of communities (e.g., caregivers & Veterans in the VA) with programs that are "consumer-driven" and that use traditional coalition building strategies and participatory action methods to collaboratively engage stakeholders and partners.

The relational/problem-solving model of stress guides the intervention and the outcome variables selected in our project. Stress is viewed as a function of the reciprocal relations among stressful life events, emotional stress responses, and problem-solving coping. Successful problem-solving coping entails developing a creative and optimistic attitude and using a structured approach to manage challenges. The model can be summarized by the acronym COPE (Creativity, Optimism, Planning, and Expert Information). Effective problem solving entails developing a **C**reative way of thinking and using one's imagination to develop ideas for solving problems. In this model, caregivers are encouraged to have an **O**ptimistic attitude. Optimism involves viewing problems as a normal part of life and recognizing that effective problem solving can be learned and successfully used. Effective **P**roblem solving involves several steps: 1) identifying and defining the problem; 2) prioritizing problems; 3) selecting the highest priority problem; 4) gathering **E**xpert information; 5) setting realistic goals; 6) listing all possible solutions; 7) choosing the best solution; and 8) evaluating the plan. Underlying this model is the premise that successful family caregiving involves open, collaborative relationships with healthcare professionals. Healthcare professionals are viewed as partners who are available to motivate, support and provide expert information (i.e., causes/consequences of problems, when and how caregivers should obtain help) when needed. Consistent with the problem-solving model, in our project, we will use the theme of RESCUE (Resources and Education for Stroke Caregivers' Understanding and Empowerment) to illustrate how caregivers in collaboration with providers act as "lifeguards" and are responsible for the safety of the stroke survivors who are under their watchful care. Regardless of what goals are set, the expected outcome of problem-solving is to minimize negative effects of stress on caregivers (depressive symptoms, perceived stress, burden) and patients (functional disabilities, healthcare utilization and costs); and optimize caregivers' knowledge, skills/behaviors (i.e., self-efficacy, perceptions of positive aspects of caregiving, satisfaction with care) and health-related quality of life.

5. Specific Aims and Hypotheses:

Our immediate, primary aim (#1): to test the effect of the intervention on stroke caregivers' depressive symptoms at approximately 11 and 19 weeks after baseline data collection. Hypothesis #1 (primary): Stroke caregivers who receive the intervention will have less depressive symptoms at approximately 11 and 19 weeks after baseline data collection compared to stroke caregivers in the usual care group.

We propose four secondary aims (#2-5):

Aim #2: to test the effect of the intervention on stroke caregivers' knowledge, perceived stress, burden, perceptions of positive aspects of caregiving, self-efficacy, health-related quality of life (HRQOL), and satisfaction with care at approximately 11 and 19 weeks after baseline data collection.

Hypotheses #2: (2a) Stroke caregivers who receive the intervention will have superior outcomes (i.e., greater knowledge, less stress, less burden, perceive more positive aspects of caregiving, greater self-efficacy, better health-related quality of life (HRQOL), and greater satisfaction with care) at approximately 11 and 19 weeks after baseline data collection than caregivers in the usual care group.

Aim #3: to test the effect of the intervention on Veterans' outcomes: Functional abilities and healthcare utilization (i.e., unintended hospital bed days of care, number of emergency room visits, number of unscheduled clinic visits) at approximately 11 and 19 weeks after baseline data collection.

Hypotheses #3: Veterans whose caregivers receive the intervention will have better functional abilities at approximately 11 and 19 weeks after baseline data collection and less healthcare utilization at 11 and 19 weeks after baseline data collection compared to Veterans whose caregivers are in the usual care group.

Aim #4: to determine the budgetary impact for implementing the intervention.

Research question: What are the costs associated with the intervention and how do they compare to usual care?

Aim #5: to determine the facilitators, barriers, and best practices for implementing the intervention.
Research questions: What are the recommendations of VA leaders, policy makers, and clinicians for planning, developing, promoting, and evaluating and implementing the intervention in other sites? What are the caregivers' perceptions of the value, strengths, and weaknesses of the intervention, and what facilitators/barriers did they identify with the intervention?

Our rationale is that findings from the primary and secondary aims will provide information about the impact of the intervention and will inform dissemination and translation of the intervention into VA practice.

6. Research Plan: The project will use mixed methods. Aims 1, 2, and 3 will test the effect of the stroke caregiver intervention on improving outcomes using quantitative methods. Aim 4 will determine the budgetary impact of the intervention using micro-costing techniques (viz., direct measurement and pseudo-billing) combined with average costing to determine the average staff time, wage, space, and equipment costs associated with the intervention. Aim 5 will use qualitative methods to determine the facilitators, barriers and best practices for implementing the intervention.

Research Design & Methods (Aim #1, 2, 3)

Design: A two-group, randomized controlled trial with three assessment points (baseline, approximately 11 weeks, and approximately 19 weeks) will be conducted. The randomization will be stratified across study sites.

Study Locations: We will recruit participants from a total of eight sites. We will have staff at three study sites in VISN8: NF/SG VHS in Gainesville, FL; James A. Haley Veterans Hospital in Tampa, FL; Bruce W. Carter Medical Center, in Miami, FL. Staff at these sites will also recruit from Michael E. Debakey VAMC in Houston, TX, Hunter Holmes McGuire VAMC in Richmond, VA, Central Arkansas Veterans Healthcare System , VA Tennessee Valley Healthcare System, and VA Boston Healthcare System via telephone and mail. All of the sites have large, in-patient hospitals, community living centers, and in-patient rehabilitation units; however, the Tampa site has a standardized, discharge planning process that involves Veteran education while the other sites have no discharge planning process. Thus, the usual/standard discharge planning care that Veterans receive at Tampa may be different than the care received by Veterans at the other sites. The research nurses will document the discharge planning care that the caregivers receive at all sites. In addition, research staff will review the Veterans' CPRS health records and describe the discharge planning care that is documented in the records. To address the issue of potential differences in usual care between study sites, and to aid in recruiting the necessary sample size, we will use a stratified, randomization procedure to achieve balanced group membership across the study sites. In our data analytic plan we will stratify by study sites in addition to controlling for baseline measurements.

Sample: We will recruit a total of 240 caregivers who will be randomized to an intervention or a usual care group (see randomization & power analysis in the data analysis section).

Eligibility Criteria: Inclusion criteria: All caregivers of Veterans with a primary diagnosis of stroke are eligible for participation if they meet the following criteria: 1) are the primary caregiver and provide the majority of care for a Veteran who has a primary diagnosis of stroke (ICD10 codes for stroke: 160.0-169.998) and who has at least one activity of daily living (ADL) deficit or a new or worsening cognitive or physical functioning problem, 2) have internet and email access and ability, 3) are reachable by cell or home phone, 4) read English at the sixth grade reading level or better, 5) score 1 or greater on the Perceived Stress Scale and 6) plan to be ultimately discharged to home or have been discharged home within the preceding 4 months 7) agree to random assignment to the intervention or usual care group.

The research staff will use a checklist for caregiver enrollment to determine the caregivers' eligibility. The research staff will determine whether the Veteran has a primary diagnosis of stroke by reviewing the Veterans' CPRS health record and by conferring with the clinical staff. Caregiver status and responsibilities will be determined by caregiver self-report. We will determine the Veterans' ADL deficits by asking caregivers which ADL deficits their Veteran has on the Barthel Index. Reading level will be indicated by the Brief Health Literacy Level screening tool. Internet and email access and ability will be determined by caregiver self-report.

Exclusion criteria: We will exclude caregivers of Veterans who are terminally ill, who are prisoners, who fail to meet one or more of the inclusion criteria, and whose Veterans have a life expectancy of less than 6 months. We will also exclude professional caregivers who had no preexisting relationship to the Veteran. Caregivers who are enrolled in or have completed similar caregiver support programs will be excluded at PI discretion. Service use will be determined by reviewing the CPRS records. We will confer with the in-patient

staff and with our clinical team members (MDs, RNs) to approximate life expectancy. The study personnel will terminate the caregiver participation if the Veteran dies during the study.

Rationale for Study Sample Size: The sample will consist of 240 caregivers. Assuming a standard deviation of 8.2, 84 subjects per group would achieve 80% power to detect a mean intervention effect size of 3.5 on depression at a 5% significance level. The sample size of 120 per group (i.e., intervention group, usual care group) was selected to account for the occurrence of a (30%) dropout rate. The 30% drop-out rate is a conservative estimate of attrition and is based on previous caregiver problem-solving intervention studies in the literature and on the attrition rates found in the internet intervention studies of our consultants, Drs. Nahm and Rupper. The expected effect size and variability was deemed reasonable based on a number of sources. In a study of caregivers of Alzheimer's patients, the investigative team described large changes pre- and post-treatment in a clinical setting, with depression from time of admission to 4 weeks post decreasing 20 points for "recovered" patients and 12 points for "still ill" patients. In a study of a telephone intervention to family caregivers of stroke caregivers, found an estimated 1 month treatment effect of 3.1.

Recruitment and enrollment:

The study will be open to all eligible caregivers. The caregivers will be recruited from 8 settings (North Florida/South Georgia Veterans Healthcare System, Miami VA Healthcare System, James A. Haley Veterans Hospital in Tampa, Michael E. DeBakey VAMC in Houston, Hunter Holmes McGuire VAMC in Richmond, Central Arkansas Veterans Healthcare System, VA Tennessee Valley Healthcare System, and VA Boston Healthcare System). We will also recruit from each facility's associated community-based outpatient clinics. Although we will recruit from the Houston, Richmond, Central Arkansas, Tennessee Valley and Boston VA Systems, all study procedures will be performed by staff at the North Florida/South Georgia, Tampa and Miami locations (i.e., no personnel at the Houston, Richmond, Arkansas, Tennessee or Boston facilities will be engaged in research). Staff at the main study sites (North Florida/South Georgia, Miami and Tampa) will be responsible for maintaining study records for participants recruited from Houston, Richmond, Arkansas, Tennessee and Boston.

Face-to-face recruitment (Gainesville, Miami, Tampa)

We will perform face-to-face recruitment for in-patient Veterans and Veterans returning for outpatient appointments at the Gainesville, Miami and Tampa sites. To recruit in-patient Veterans and Veterans returning to VA clinics for outpatient appointments, we will meet with the clinical staff in the VA settings that care for Veterans with strokes and describe our study. We will also notify VA clinicians of the study via email. Clinicians in the VA will ask Veterans with stroke who are receiving care on their units or facilities and/or their caregivers if they are interested in talking to a research staff member about the study. The VA clinicians who care for Veterans with a stroke are busy and often rotate shifts, so study Nurses will additionally review the VA's computerized record system (CPRS) to identify in-patient Veterans in order to assist the clinicians in locating potential participants. The study Nurses will review the minimum amount of information necessary to determine if the Veteran is admitted for new onset stroke. Once a Veteran is identified as having a new onset stroke, the study Nurse will notify a VA clinician involved in that Veteran's care either in person, by phone, or through encrypted e-mail. The clinician will then ask the Veteran and/ or caregiver if they are interested in talking to a research staff member about the study. If either the Veteran or caregiver is interested in the study, the study staff members will contact the caregiver and/or Veteran (using contact information found in CPRS or provided by the clinician) to arrange times to meet or talk with the caregiver and Veteran.

Next, we will make two recruitment contacts (i.e. in person or by phone) with the Veterans and caregivers. First recruitment contact: the research staff will explain the study to the Veteran and caregiver and ask if they are interested. If the Veteran and caregiver are still interested, the research staff will screen the caregiver for study eligibility. The research staff will use a checklist for caregiver enrollment to determine the caregivers' eligibility. (See inclusion/exclusion criteria section for procedures to determine caregivers' study eligibility). If Veterans and caregivers are interested and eligible, we will provide them with a folder containing copies of the informed consent documents so that they can review it and/or discuss with their family and friends. Study staff will give caregivers and Veterans a recruitment card with brief study information and staff contact information for reference. Second recruitment contact: for eligible caregivers and Veterans, the research staff will meet in person or call the caregiver and Veteran on the telephone to implement the standard consenting process that will be in compliance with VA Central IRB and Research & Development Committees

at the study sites. We will also implement the following consenting process with the caregivers' Veterans. We will explain that the Veterans will not be involved in the study intervention, but that the research team needs to review the Veterans' medical record to obtain information on the Veterans' demographic characteristics, clinical characteristics, and healthcare utilization. We will determine the Veterans' decision-making capacity by asking the Veteran three questions to determine their orientation (what is the month?, what is the year?, what state are we in?). If the Veteran is unable to answer these questions correctly, they will be considered to have potential diminished decision-making capacity. We will also assess their comprehension. After the research team member has discussed the study with the Veteran, the research team member will ask the Veteran to reiterate back their understanding of study, the potential risks/benefits of the study, that his/her participation is voluntary, and that he/she can terminate participation, and so on. Veterans who are unable to reiterate their understanding will be considered to have potential diminished decision making capacity. Since stroke can affect different parts of the brain, the Veteran may have full decision making capability, but be aphasic or unable to speak clearly and unable to answer the questions related to orientation or be able to describe the study. In these cases, we will confer with the clinical staff regarding the Veteran's aphasia and decision making capacity. We were advised by a neuropsychologist regarding how to assess stoke patients' decision-making capacity. We will obtain assent of the Veterans and we will respect any dissent of the Veterans. The legally authorized representation (LAR) will be asked to give consent for Veterans with diminished decision making capacity. The research team member will inform the LAR of the roles and responsibilities of the LAR and will provide the LAR with all the information that would have been provided to the participant. If the Veterans have physical disabilities and unable to sign the informed consent forms and HIPAA authorization forms, the Veterans will be asked to make marks on the forms with witnesses present.

Outpatient Recruitment via Telephone (All Sites)

We will recruit Veterans that have been discharged home within the previous 4 months from all five settings. To recruit Veterans that have been discharged home within the last 4 months, we will develop a list of potential participants (including SSN and date of birth) by reviewing the VA Patient Care Encounter Package Dataset and the VA's Computerized Records System (CPRS) to identify Veterans at the 8 recruitment locations with a diagnosis of stroke based on ICD10 codes. We will mail letters of invitation and self-addressed, stamped, recruitment postcards with an opt-in/opt-out option to the Veteran or their next of kin.

A research staff member will then telephone the Veteran or their next of kin (i.e., those who returned the postcards with positive responses, those who did not return the postcards). The staff member will identify the Veteran's caregiver or confirm the next of kin is the Veteran's caregiver, explain the study and ask if there are questions. If the Veteran and caregiver are willing to participate, the staff member will confirm that the individuals meet all the other study eligibility criteria. The research staff will use a checklist for caregiver enrollment to determine the caregivers' eligibility (see inclusion/exclusion criteria section for procedures to determine caregivers' study eligibility). Once eligibility is confirmed, study personnel will mail Informed Consent Forms and HIPAA Authorization Forms, with a self-addressed stamped envelope so that the caregiver can mail it back to us. After caregivers and Veterans have had a chance to review the consent and HIPAA forms, the research staff will call the caregiver on the telephone to implement the standard consenting process that will be in compliance with VA Central IRB and Research & Development Committees at the study sites. We will also implement the consenting process, as described above, with the caregivers' Veterans. Once study personnel receive the signed forms, the original consents will be retained by PI in participant's subject file and a copy will be mailed to participants. Study documents for subjects from the Houston, Richmond, Central Arkansas, Tennessee Valley and Boston locations will be maintained by staff at the main study sites (Gainesville, Miami and Tampa).

A brief description of the study and staff contact information will also be posted on the RESCUE website (http://www.cidrr8.research.va.gov/rescue). Caregivers or Veterans who contact study staff will be screened and consented following the same procedures described previously.

Recruitment at Affiliate Facilities:

Recruitment may also occur at affiliate facilities (hospitals or rehabilitation facilities). Clinicians at these facilities will hand recruitment cards to inpatient Veterans with stroke on their units and the Veterans' caregivers. The cards will contain information about the study and a contact number. We will also post recruitment flyers with the research nurse's contact information at these facilities. If interested, the caregiver or Veteran will contact study staff who will arrange a time to explain the study, screen for eligibility and consent

either in-person at the facility or over the phone. All other recruitment and enrollment procedures will be followed as outlined above. Affiliate facility staff members will not be directly engaged in research and no patient information will be shared from the affiliate facility.

Recruitment tracking: We will track the number of caregivers who decline to participate and the reasons for their non-participation.

Randomization:

The proposed study will use a two-group randomized design with 3 assessment points (baseline, approximately 11 weeks, and approximately 19 weeks). Following baseline assessments, the participant will be randomly assigned to one of the two study groups (Intervention or Usual Care). The Pocock-Simon covariate adaptive randomization procedure will be used so that there will be approximately equal number of subjects assigned to the two groups within each covariate level (depressed or not and high or low ADL) and within each study site. The statistician will develop the randomization scheme and share it with the project coordinator and a research staff member at each site. When a caregiver is enrolled in the study, this staff member at site will obtain the group assignment for that caregiver from the randomization system.

Data Collection:

Research personnel will follow a step-by-step study procedure manual to collect the data. Research staff will meet or telephone caregivers who are interested in learning more about the study. We will arrange times to meet or talk with the caregivers that are convenient with the caregivers. The research staff will discuss the study and provide the caregivers a copy of the informed consent document, so that they can review it and/or discuss with their family and friends. For caregivers who are willing to participate, the research staff will arrange an in-person or telephone meeting to determine the caregivers' study eligibility (also see inclusion/exclusion criteria & recruitment and enrollment sections). For eligible caregivers, the research staff will meet in person with the caregivers and Veterans or call them to implement the standard consenting process that will be in compliance with VA Central IRB and Research & Development Committees at the 3 study sites. If a discharge date is not known at this time, study staff will call the caregiver on a weekly basis to check on the status of the veteran's discharge.

Once the Veteran and caregiver are enrolled in the study, baseline data will be collected over the phone. If the Veteran is an inpatient at the time of enrollment, baseline data will be collected after the Veteran is discharged. The research staff will ask the caregivers questions on the demographic data forms and survey questionnaires (stroke caregivers' depression, knowledge, perceived stress, burden, perception of positive aspects of caregiving, self-efficacy, health-related quality of life (HRQOL), and satisfaction with care).

The research staff member will also review the caregivers' Veterans CPRS record to document the Veterans' age, gender, race/ethnicity, category of facility (hospital, community living center, rehabilitation facility) from which the Veteran was discharged to home, length of hospital and/or post-stroke rehabilitation stay, date/location/type of the stroke, number of previous strokes, and healthcare use. The research staff member will document any information in the record related to the Veterans' discharge plans (i.e., treatments, medicines, patient and family education, case management, services).

The post-test assessments (stroke caregivers' depression, perceived stress, knowledge, burden, perception of positive aspects of caregiving, self-efficacy, health-related quality of life (HRQOL), and satisfaction with care) will be collected at approximately 11 weeks and approximately 19 weeks after the Veterans' discharge. A study team member at the main study site (Gainesville), who will be blinded to the group assignment of the caregivers, will telephone the caregivers to obtain the post-test assessments. The research staff will also review the Veterans' CPRS record and document the Veterans' healthcare utilization since their discharge to home. To minimize loss to follow-up, we will contact participants 24 hours before each post-test assessment to remind them of their scheduled appointment time. We will also mail postcards to enrolled caregivers who we cannot contact after 3 attempts to reduce attrition.

In the event that the RN conducting the intervention or the research personnel conducting the pre-and post-test assessments uncovers that the caregivers are experiencing unmanageable stress, but not severe stress, the research personnel will advise the caregivers to call their assigned VA primary care social workers and primary care clinicians (MD, ARNP, PA) of their Veterans' care team. The research personnel will also give the caregivers the phone number of the VA Caregiver Support Line and other referral sources as needed. If the research personnel assesses that the caregivers are in severe stress or crisis or if the research personnel

uncovers that the Veteran has serious changes in his/her health, the research personnel will call the primary care provider/social worker of the Veteran's care team or the local emergency response system (9-1-1). In the event that any abuse or neglect is suspected, study personnel will follow established procedures by oversight agencies, including VHA as directed in the VA Handbook 1050.01, to contact the Office of Inspector General, Office of Investigation, as well as the IRB and the state of Florida Abuse Hotline.

Efforts to improve retention of participants: To improve the chances that participants will complete the project, we will conduct the 11-week and 19-week post-test assessments at times that are convenient to the caregivers.

Overview of the Intervention

We will use a nurse-guided, multi-component transition-to-home planning intervention. The intervention is designed to enhance, rather than substitute for the usual post-discharge efforts that are already in place at VA medical facilities. The transition-to-home component of the intervention (i.e., caregiver training using the RESCUE website) will be conducted in one or two sessions with stroke caregivers over the phone after baseline data collection. The in-home component will include 8 sessions of skills training on the RESCUE website followed by application of the problem-solving approach via the RESCUE messaging center. The intervention is designed to enhance stroke caregiver problem-solving skills and improve both caregiver and Veteran outcomes. The intervention is based on the relational/problem-solving model of stress. The intervention is tailored to address the self-identified needs of the caregivers.

The uniqueness of this proposed intervention is that it adds technology-based components (Internet training and messaging) to the traditional, in-person, problem-solving intervention. We designed our intervention to be minimally disruptive to caregivers' schedules. This entailed developing an intervention that could be delivered in a one-time session over the phone followed by online training and messaging that caregivers could do at convenient times. Below, we separately discuss each component of the intervention: a) RESCUE website, b) transition-to-home telephone session, and c) In-home, online training and problem-solving sessions.

a) The RESCUE Stroke Caregiver Website serves as the foundation for the entire intervention (transition-to-home session and the in-home sessions). The goal of the website, which is named Resources and Education for Stroke Caregivers' Understanding and Empowerment (RESCUE), is to help family members become skilled caregivers by providing comprehensive information to manage their own problems and those of their survivors. The website is evidence-based and consumer driven and houses information/tools, a problem-solving module, and a problem-solving diary form that are integral components of the intervention (see following sections and appendix for examples; visit the website at **http://www.cidrr8.research.va.gov/rescue/)**.

The website includes the following sections: 1) an extensive list of resources; 2) a library of the monthly/bimonthly patient education newsletters; 3) self-help tools; 4) a glossary of medical terms with phonetic pronunciations; 5) testimonials or stories from stroke caregivers; 6) links to other stroke and caregiver websites; 7) a factsheet library; 8) a problem-solving training module, and 9) a problem-solving diary form. A major component of our proposed intervention is the comprehensive library of factsheets for stroke caregivers (see following table for categories and topics).

b) Intervention Component (#1): Transition-to-Home Telephone Session: (includes the RESCUE problem-solving module and diary accessible on http://www.cidrr8.research.va.gov/rescue/ and in appendix**)**. The research **nurses at each site** will conduct telephone sessions with the caregivers shortly after baseline data is collected. The nurses will follow a structured protocol (see following table) and script. The problem-solving module on the RESCUE website serves as the primary teaching tool for this session. Similar to how teachers use power-point presentations for classroom instruction, the nurses will use the module to teach the problem solving method.

Protocol: Telephone, Transition-to-Home Session(s) using the Problem-Solving Module and RESCUE website	
#1 Objective: Rapport building and caregiver assessment	The nurses will begin with an "icebreaker" to build rapport by asking the caregivers to talk about their families. Next, the nurses will ask the caregivers to talk about their stroke survivors before and after the stroke. Last, the nurses will ask the caregivers to talk about themselves and what they know or have learned while in the hospital about taking care of someone who has suffered a stroke.

#2 Objective: **Tour of the RESCUE caregiver website**	The nurses will mail the caregivers the RESCUE workbook that prominently displays the RESCUE website access procedures on the cover. The nurses will then give the caregivers a guided tour of the RESCUE website over the phone. The nurses will navigate through the website with the caregiver and show the caregivers the various website features.
#3 Objective: **Review of the Problem-Solving Module on the RESCUE website**	a) The nurses will ask the caregivers to click and open the problem-solving module. The module discusses the basic concepts of the problem-solving approach. Problems are viewed as challenges and successfully handled by developing a **Creative** way of thinking. Problems are resolved by developing an **Optimistic** attitude. Using a **Planning-solving** approach involves 8 steps: 1) identifying and defining problems; 2) prioritizing problems; 3) selecting the highest priority problem; 4) gathering **Expert** information; 5) setting realistic goals; 6) listing all possible solutions; 7) choosing the best solution; and 8) evaluating the plan. b) Prior to moving to the next part of the module, the research nurses will ask scripted questions to determine the caregivers' understanding and will clarify information as needed.
#4 Objective: **Application of the problem-solving approach and the RESCUE website to address a common caregiver problem – STRESS & DEPRESSION**	a) The nurses and caregivers will next read the illustrative example or scenario in the problem-solving module that discusses a *fictional* caregiver named Alice who has depression and stress. The nurses will show the caregiver how to apply the problem-solving approach using the information and tools on the RESCUE website to help resolve Alice's stress and depression. b) The research nurses will then illustrate how to apply the problem-solving approach. c) Throughout the instruction, the nurses will emphasize the importance of having a positive attitude, remembering that most caregivers experience depressive symptoms (i.e., normalizing their experiences) and reinforcing that there are strategies to alleviate stress.
#5 Objective **Development of a personalized problem-solving plan**	a) The caregivers will identify all potential problems. b) Caregivers will use a printed copy of the "problem-solving diary" that is on the RESCUE website. This diary will be mailed to the caregivers. The caregivers will use the diary to write down their problems, prioritize their problems, and identify the most troublesome problem. The caregivers will read and discuss the factsheet(s) on the RESCUE caregiver website related to their most troublesome problem. The caregivers will list realistic goal(s), possible solutions, and evaluation plans.
#6 Objective **Summary of the problem-solving approach, in-home sessions, and RESCUE workbook**	a) The nurses will summarize the session and answer questions. b) The nurses will review the purpose and procedures of the follow-up sessions that the caregivers will participate in at home on their computers (referred to as "in-home sessions"). The nurses will review the RESCUE website and verify that the caregivers know how to use the RESCUE messaging center (see in-home section).

RESCUE Problem-Solving Diary Form: The caregivers will write their personalized problem-solving plans on a diary form. A blank diary form can be printed from the RESCUE website. The form provides spaces to list and prioritize problems, goals, solutions, and evaluation plans. During the telephone session, the caregivers will use a printed diary form to develop their personalized plan that they will update as needed (e.g., in-home sessions and after the study is completed). Caregivers will be reminded that they can go to the RESCUE website and print the blank diary forms as needed.

RESCUE Information: Caregivers will be given the URL of the VA-secured RESCUE Messaging Center and information (telephone number) about how to call the VA National Caregiver Support Line.

c) Intervention Component (#2): In-Home Skills Training and Problem-Solving Sessions. The sessions will reinforce, sustain, and add to what was learned during the transition-to-home telephone session. The goals of the in-home component are to refresh the caregiver's knowledge of the problem-solving method, motivate and empower the caregivers' abilities to access information on the RESCUE website to resolve their personal problems, and provide additional skills training to facilitate caregivers' successful adjustment after Veterans' return to home. We will begin the in-home sessions within the first four months after the Veterans' discharge because this is the time caregivers recognize that the changes in their loved one may be permanent and

become most stressed. This is also the time that caregivers are most in need of information and support as they adjust to new roles. We will conduct 8 sessions.

The in-home sessions involve two parts: 1) skills training on the RESCUE website, and 2) problem-solving planning via the RESCUE messaging center. For part one, caregivers will learn a new caregiving skill each session by reading a different factsheet on the RESCUE website.

In the second part of each in-home session, the caregivers will apply their skills training to develop personalized problem-solving plans using the RESCUE messaging center. The messaging center is a secure site that is located behind the VA firewall. The messaging center uses a free-text format that will enable the caregivers at home and the research nurses to asynchronously communicate and collaborate online over an encrypted channel. Participants will receive reminder emails 48 hours before each messaging center session. The messaging center is designed to assist participants in improving their abilities to problem-solve and thereby decrease their depressive symptoms. The caregiver-nurse interaction on the messaging center will reinforce information that the caregiver received during the transition-to-home session and the skills training on the RESCUE website. The role of the research nurses is to empower participants via the messaging center to act on their own behalf by providing acceptance and integration of new knowledge and suggesting alternatives.

The RESCUE messaging center is an adaptation of the currently available Low-ADL Monitoring Program (LAMP) platform that has been successfully used at our facility (North Florida/South Georgia VHS) by 1774 Veterans since 2003. With the guidance of our Co-I, Dr. Levy, and consultant, Steven Moore, we modified the existing code base on the LAMP platform and began the initial steps to create the RESCUE messaging center. We also pretested the current message center.

During the transition-to-home session, the research nurses will discuss the procedures of the in-home sessions and explain how to access and use the RESCUE messaging center. In the transition-to-home session, the nurses will stress that the messaging center should **not** be relied on by the caregivers to have their problems solved by the research nurses. Rather, the caregivers will be told that the messaging center is to help them learn how to solve their own problems. The nurses will emphasize that the caregiver should **NOT** use the messaging center as a substitute for their primary care provider or to address problems that are urgent and require immediate support and help. In the in-home sessions, if the caregivers have any problems with the RESCUE messaging center, they can call the project coordinator.

We will maintain records of “exact correspondence” of the caregiver and nurse communications on the messaging center. We will also collect data on the time spent or minutes that the caregivers and study nurse interact via the messaging center. This data will allow us to monitor participant adherence. To minimize loss to follow-up, if necessary, we will contact participants 24 hours before scheduled data collections/sessions to remind them of their session. We will also mail reminder postcards to enrolled caregivers that we are unable to contact after 3 attempts to reduce attrition.

If after starting, a caregiver is unable or unwilling to continue with the intervention they will be offered the opportunity to discontinue the intervention but remain in the study for data collection phone calls. These phone calls will occur approximately 11 and 19 weeks after baseline data collection. To be eligible to complete these optional data collection phone calls, the caregiver must have completed at least one phone or messaging center intervention session.

Usual Care Group: The caregivers’ Veterans will receive usual or standard care. The caregivers will receive the standard information and discharge planning that is provided to all stroke caregivers. There will be no changes in the care the Veterans normally receive or in the information and discharge planning that the caregivers normally receive.

Fidelity Considerations: We will develop standardized manuals and protocols. This manual will provide step-by-step guidelines on recruiting/enrolling participants, implementing the informed consent process, in conducting the transition-to-home and in-home sessions and implementing the data collection procedures. We will provide extensive training to all of our team members. The PI and one staff member will periodically visit (minimally once a year) the Tampa and Miami study sites and observe the research nurses conducting the transition-to-home session. Feedback will be provided as needed.

Similar to our previous projects, we will have regular conference calls with our team members at the three study sites (Gainesville, Miami and Tampa). In these meetings, team members will describe how they are

implementing the intervention and discuss protocol issues. To monitor the delivery of the intervention, we will listen to each research nurse's first one or two transition-to-home sessions to identify any fidelity issues at the beginning of the project. Following this initial monitoring, we will periodically listen to the remaining sessions, making sure that we have fidelity checks during the beginning, middle, and end of the first component of the intervention. We will also ask the research nurses to track the number of minutes they spend with each participant and to keep detailed notes of any deviations from our study protocol that occur during the transition-to-home sessions. The PI and project coordinator will discuss the deliveries of the intervention and evaluate adherence to study protocols, noting all deviations on a form. Feedback will be provided to the research nurses.

In a similar fashion, we will monitor the in-home sessions (in the intervention) that are conducted via the RESCUE messaging center. We will review the first two "exact correspondences" of the caregiver and nurse to identify initial, fidelity issues. After this assessment, we will periodically review the exact correspondences between the caregiver and nursing on the messaging center to ensure that we have fidelity checks throughout the project. The research nurses conducting the in-home sessions will also keep detailed notes of any deviations in protocol that occur during the in-home sessions. The PI and project coordinator will review the fidelity check data and provide feedback, as needed, to the main study, research nurse.

We will evaluate "enactment" using the Treatment Fidelity Tool. After completion of the study, we will ask caregivers (in intervention group) to rate the amount of information and contact they received during the transition-to-home and in-home sessions (too little, just right, too much), how much they used the skill-building strategies (not used, used a little, used often, used all the time) and the RESCUE website (never, infrequently, monthly, every 2-3 weeks, every week, every day,) how helpful the intervention was (not helpful, little, moderate, extremely,) and whether their problems were resolved (not resolved, making progress, fully resolved, resolved now). We will ask caregivers in the standard care group how much they used the RESCUE website (never, infrequently, monthly, every 2-3 weeks, every week, every day) and whether their problems were resolved (not resolved, making progress, fully resolved, resolved now).

Training of investigative team members: Prior to interacting with participants, team members at all study sites will have a training meeting in Gainesville. This meeting will include the PI, project coordinator (PC), site PIs, and all research nurses. Other research team members will participate at designated times. We will carefully review the study manual and protocols and the project timeline. Although all of the research nurses will be experienced clinicians with expertise in motivational interviewing, we will review the principles and techniques of this approach. We will give feedback to research staff members after they have completed "mock" sessions performing the screening, the informed consent, and baseline assessment procedures. We will also give feedback to the nurses after they have completed "mock sessions" for the transition-to-home intervention. These staff members will be required to "pass" a role-playing session in front of the PI, site PIs, and PC.

We will extensively train the study staff who will conduct the post-test assessments, including the qualitative interviews. We have hired study staff that have experience in motivational and qualitative interviewing. Nonetheless, we will extensively train the study staff on these techniques. The study staff will practice interviewing techniques with feedback from the PI and project coordinator. The study staff will be required to "pass" a role-playing session.

Similarly, we will train the research nurses who will communicate with the caregivers via the RESCUE messaging center in the intervention group (second intervention component). We will conduct "mock sessions" in which the PI and project coordinator will monitor the nurse as she/he conducts these sessions. The nurse will be required to successfully "pass" two messaging sessions with a "proxy" caregiver in front of the PI and PC who will provide feedback for improving the nurse's online messaging skills.

Measures: We carefully chose measures that had good psychometric properties, were easy to administer, and were relatively short in length to reduce participant burden. An important consideration in our selection was including measures that had been used in our previous studies and in other caregiver studies so that we could compare our results with others. In addition, to address the "common caregiver dataset requirement" in this targeted solicitation we selected caregiver measures that have been evaluated historically in the literature. Most of the measures selected were tools that our team members had used previously in other studies. In the

table below, we describe the measures we will use for screening caregivers to determine their study eligibility as well as the measures related to testing hypotheses 1-3. Our other measures are described in later sections.

Instruments/Measures		
Concept – Instrument/Measure	**Description of Instrument/Measure**	**Mean Time**
Screening Instruments		
Caregiver Literacy Level – BRIEF health literacy screening tool *Haun, et al., 2009*	This is a four-item health literacy screening tool that has been shown to accurately identify individuals with inadequate health literacy or persons who have below 7th grade reading level. The tool has adequate sensitivity and specificity.	**<2 minutes**
Veterans' Activity of Daily Living - Barthel Index *Mahoney FI & Barthel D, 1965*	This tool consists of 10 items that measure patients' abilities to perform self-care tasks (e.g., feeding, bathing, personal toileting, dressing, chair/bed transfers, ambulation). The tool has been used extensively in studies of outcomes of care in rehabilitation settings. We will screen caregivers by asking them if their stroke survivor needs assistance performing the tasks.	**<2 minutes**
Perceived Stress Scale-Screening *Cohen S & Williamson G, 1988*	The PSS-4 was designed for use with community samples with at least a junior high school education, the items are easy to understand and the response alternatives are simple to grasp. Moreover, the questions are quite general in nature and hence relatively free of content specific to any sub population group. Caregivers should score a 1 or greater on this tool to be eligible for enrollment.	**<2 minutes**
Caregiver Measures (Pre- and Post-Test Assessments)		
Demographic and Health Characteristics	Age, sex, marital status, educational level, race/ethnicity, relationship to stroke survivor will be collected by self-report.	**<5 minutes**
Stroke Knowledge *National Institutes of Health*	Stroke Knowledge is an instrument developed by the National Institutes of Health to measure individuals' knowledge of stroke.	**<5 minutes**
Perceived Stress Scale *Cohen S & Williamson G, 1988*	The PSS-4 was designed for use with community samples with at least a junior high school education, the items are easy to understand and the response alternatives are simple to grasp. Moreover, the questions are quite general in nature and hence relatively free of content specific to any sub population group.	**<2 minutes**
Depressive Symptoms - Center for Epidemiologic Studies Depression (CES-D 20) *Eaton W, et al., 1994*	CES-D is a 20-item, 4-point Likert scale ranging from never (0) to most of the time (3). It assesses depressive symptoms and is not a clinical measure of depression. Scores range from 0-60 with higher scores indicating greater depressive symptoms. It has been used in numerous studies with caregivers, and has good reliability and validity.	**<8 minutes**
Positive Aspects of Caregiving Scale—11-Item *Boerner, et al., 2004*	The Positive Aspects of Caregiving Scale is an 11-item 5-point Likert scale ranging from *disagree a lot* (1) to *agree a lot* (5). Higher scores indicate greater benefits from caregiving.	**<5 minutes**
Revised Scale for Caregiver Self-Efficacy *Steffen et al. 2002*	This is a 15-item measure of caregivers' judgments regarding their ability to perform effectively in specific, caregiving settings. We will administer two sub-scales of the instrument: Caregiver Self-Efficacy for Obtaining Respite and Caregiver Self Efficacy for Controlling Upsetting Thoughts about Caregiving. Respondents rate their level of confidence for each item on a scale from 0 to 100. The tool has established reliability and validity. We selected this self-efficacy tool because it was developed specifically for caregivers	**<5 minutes**

Caregiver Burden – Short Version of the Zarit Burden Interview (S-ZBI) *Zarit, 1980*	This is a 12-item instrument that has been reduced from the original, full 29-item instrument.[125] The short version was correlated with the full version with correlation coefficients ranging from 0.92 to 0.97. The S-ZBI measures the degree of burden felt by caregivers. Items fall into five categories (health, well-being, finances, social life, relationship with impaired person). The instrument was originally developed to measure burden of caregivers of patients with dementia. However, the S-ZBI has been used in stroke caregiver studies. We selected this tool above other burden instruments because it is brief, easy-to-answer, measures both subjective and objective burden, and is widely-used.	**<5 minutes**
RAND 12-Item Health Survey (VR-12) *Kazis et al., 1998*	The VR-12 consists of 12 items that measure health-related quality of life. As recommended by Ware,[126] we will transform raw data scores so that comparisons can be made with norms. Thus, scores will range from 0-100, with higher scores indicating better general health perceptions. The tool has been widely used in stroke caregiver studies and has established psychometric properties. We have used this tool in prior studies.	**<2 minutes**
Patient Satisfaction – General Satisfaction Subscale of the Long-Form Patient Satisfaction Question. (PSQ-III) *Ware JE, et al., 1976*	The General Satisfaction Subscale consists of 6 items. Responses to items range from 1=strongly agree to 5=strongly disagree. Lower scores indicate greater satisfaction. The subscale has adequate internal consistency and test-retest reliabilities. Validity of the tool has been supported in numerous studies. We selected this tool because it is brief, has good psychometric properties[131] and is easy-to-read as we found in our previous studies.	**<5 minutes**
Oberst Caregiving Burden Scale *Oberst et al, 1991*	This instrument uses a 5-point response scale to measure the perceived amount of time spent and perceived level of difficulty for 15 caregiving tasks. Higher scores indicate more perceived time spent or difficulty with caregiving tasks.	**<8 minutes**
Problem Checklist	This instrument was created for the study. The instrument asks caregivers to indicate what problems they or their Veterans are dealing with.	**<5 minutes**
Veteran Measures		
Demographic and Health-related variables	Age, gender, race/ethnicity, facility from which Veteran was discharge to home (i.e., hospital, community living center, rehabilitation), length of post-stroke rehabilitation, location/type of the stroke, and number of previous strokes will be obtained from CPRS review.	**N/A**
Functional Abilities – Barthel Index (Caregivers answer this form) *Mahoney FI & Barthel D, 1965*	The Barthel Index is a frequently used tool to measure functional ability in both clinical and research settings. It has established validity, reliability, and sensitivity. We decided not to use the Functional Independence Measure (FIM), because FIM scores in the Veterans' CPRS records will not coincide when the study assessments will be conducted. Because the FIM items are based on the Barthel Index, we believe this index is a good proxy for the FIM.	**<2 minutes**
Healthcare Utilization – Unintended hospital bed days of care, number of emergency room visits, number of unscheduled clinic visits	Data on healthcare utilization will be obtained from the CPRS records.	**N/A**
Cost Data – See Aim #3	We will obtain the standard cost data from the VA Managerial Cost Accounting System (MCAS) (formerly DSS) National Data Extracts (NDE) (total, nursing, pharmacy, laboratory, etc.) by fixed and variable categories and the Non-VA Medical Care files.	**N/A**
	Measures to check fidelity (see section on Fidelity)	
Enactment	We will use the Treatment Fidelity Tool and ask caregivers in the intervention to rate the amount and value of the information they received (see section on fidelity).	**<5 minutes**

RESCUE messaging center	We will monitor the content of the Messaging Center sessions via "exact correspondence" between caregivers and the nurse.	**N/A**

Data Analysis:

Hypothesis #1 (primary): **Stroke caregivers who receive the intervention will have less depressive symptoms at approximately 11 and 19 weeks compared to stroke caregivers in the usual care group.** Our primary endpoint is the caregiver depressive score. The focus of the primary analysis will be to examine the effect of the intervention based on "intention to treat." Data from all the participants will be part of the primary analyses regardless of actual number of completed in-home sessions. Thus, we are examining the effectiveness of the intervention taking into account real world compliance factors. As an exploratory study element, we will assess compliance and attempt to determine its effect on study results.

For the primary analysis, the general linear mixed model for repeated measures will be used to model the follow-up depression times (approximately 11 and 19 weeks after baseline data collection), adjusted for site and baseline scores as fixed effects. Since the Tampa site has a standardized, discharge planning process that involves Veteran education while the other sites have no discharge planning process, there may be different responses due to usual care between the Tampa versus other sites. Thus, we will first explore whether or not there is a differential treatment effect at the Tampa site by fitting a full model that allows for Tampa to have a differential time and group effect for each time point. Let y_{ij} be the depression score for person *i* at time *j*, then Full fixed effects model will be:

$$E(y_{ij}) = \beta_0 + \beta_1 Baseline_i + \beta_2 Tampa_i + \Sigma_s \beta_{3s}\, I(Site_i = s) + \beta_4 Time_{ij} + \beta_5 Group_i + \beta_6 Group_i * Time_{ij} + \beta_7 Tampa_i * Time_{ij} + \beta_8 Tampa_i * Group_i + \beta_9\, Tampa_i * Group_i * Time_{ij}$$

with covariates for baseline depression and time since discharge (*Baseline*), site *(*e.g., *Tampa*=1 if Tampa, 0 otherwise; and β_{3s} represent effects of sites compared to reference site Gainesville), time (*Time*=0 for 11 weeks, 1 for 19 weeks), and group (0 if active control, 1 if intervention). Of primary interest is the estimated within-site intervention effect at approximately 11 weeks after baseline data collection, controlling for baseline and stratifying by site. The initial test will be the test of $\beta_8 + \beta_9 = 0$, which tests whether the Tampa site has a differential group effect compared to the other sites at approximately 11 weeks after baseline data collection. If a site difference in treatment effect is found, then results will be conditional on Tampa or Miami/Gainesville. In this case, the primary tests of interest will be the estimated within-site intervention effect at approximately 11 weeks after baseline data collection, controlling for baseline and stratifying by site. In the model above, this corresponds to the test of $\beta_5 = 0$ for other sites and $\beta_5 + \beta_8 = 0$ *for Tampa*. If no difference is found in our initial interaction test, we will assume that the Tampa site does not have a differential treatment effect and the interaction will be removed from the model. The new fixed effect portion of the model will simplify to the Reduced model:

$$E(y_{ij}) = \beta_0 + \beta_1 Baseline_i + \beta_2 Tampa_i + \Sigma_s \beta_{3s}\, I(Site_i = s) + \beta_4 Time_{ij} + \beta_5 Group_i + \beta_6 Group_i * Time_{ij}$$

Of primary interest is the estimated within-site intervention effect at approximately 11 weeks after baseline data collection, controlling for baseline covariates and stratifying by site. In the model above, this is the test of $\beta_5 = 0$. In order to control for possible chance sample imbalances resulting from randomization, the model will include covariates for baseline prognostic factors (e.g., discharge from hospital, community living center, or rehabilitation facility; caregivers' relationship to Veteran; number of previous strokes among Veterans, etc.), deemed to have significant relationships with response and groupwise imbalances. Thus, analyses will be able to compare the groups on the measure of interest while controlling for these factors. As a supplemental analysis we will assess long term intervention effects at the approximately 19 week after baseline data collection time point. In the Full model above, this is the test of $\beta_6 = 0$ for other sites, and $\beta_6 + \beta_9 = 0$ for Tampa. In the reduced model, this is simply the test of $\beta_6 = 0$. All tests will be performed at the α=0.05 significance level. The correlation among observations from the same person will be accounted for through the inclusion of a random person effect into the mixed model analysis.

Hypotheses #2 (secondary): **(2a) Stroke caregivers who receive the intervention will have superior outcomes (i.e., less burden, less stress, greater self-efficacy, perceive greater positive aspects of**

caregiving, better HRQOL, and greater satisfaction with care) at approximately *11 and 19* weeks after baseline data collection than caregivers in the usual care group.
The analysis plan for Hypothesis 2 will closely follow the plan outlined above for Hypothesis 1 for each secondary outcome of interest.

Hypotheses #3 (secondary): **Veterans whose caregivers receive the intervention will have better functional abilities at approximately *11 and 19* weeks after baseline data collection and less healthcare utilization at approximately 11 and 19 weeks after baseline data collection compared to Veterans whose caregivers are in the usual care group.**
Since the Barthel Index score can be treated as continuous, the analysis plan follows exactly as above in Hypothesis 1. Since the Veteran healthcare utilization measures are count data, the models will be somewhat different. There will be no baseline covariates added to the model, as they are not applicable to the count measures. Analyses will be conducted for the period following baseline data collection to approximately 11 weeks and 19 weeks after baseline data collection. Generalized linear models for count data (such as Poisson or negative binomial regression models, depending on the presence or absence of over-dispersion) will be employed to determine the group effects on healthcare utilization. As before, the site type will be included in the full model and possible site differences will be accounted for. Log link functions will be employed on the count data to create the correct distributional data forms. As before, in order to control for possible sample imbalances resulting from randomization, all models will include covariates for prognostic factors deemed to have significant relationships with response and significant groupwise imbalances. Thus, analyses will be able to compare the groups on the measures of interest while controlling for these factors.
Handling of Missing Data: We should not have a problem with missing data as our data will be collected in-person or over the telephone. Our data collectors will receive extensive training on interviewing and how to politely encourage participants to answer all questions on research instruments. In the event of drop-outs, the missingness mechanism will be explored. If the assumption of Missing Completely at Random (MCAR) or the common assumption of Missing at Random (MAR) are plausible, then little change to the analysis plan is necessary. The mixed models analysis using direct-likelihood approaches will be unbiased and appropriate. Study efficiency (power) will of course be affected by the smaller amount of available information, thus we have inflated the planned recruitment sample size. If the missingness assumptions are not plausible, then Missing Not at Random (MNAR) techniques will be employed and analysis results will be interpreted with caution.

Research Design and Methods (Aim #4)
Research Question: **What are the budgetary impacts associated with the intervention and how do these costs compare to usual care?**
Data collection & measures: We will obtain cost data in the VA Managerial Cost Accounting System (MCAS) (formerly DSS) National Data Extracts (NDE) (total, nursing, pharmacy, laboratory, etc.) by fixed and variable categories and the Non-VA Medical Care files, supplemented by the direct measures (i.e., microcosting) of the intervention as necessary.
Research Question: **What are the budgetary impacts associated with the intervention and how do these costs compare to the costs of usual care?**
The budgetary impact of this intervention will consist of two parts: (1) the incremental cost of the intervention itself over and above usual care, and (2) the impact of the intervention on healthcare utilization. To determine the incremental costs of the intervention, we will use micro-costing techniques (viz., direct measurement and pseudo-billing) combined with average costing to determine the average staff time, wage, space, and equipment costs associated with the intervention. The micro-cost estimate for the transition-to-home and in-home sessions will use the average elapsed time of such sessions along with an estimate of the average national wage of the type of nurse most likely to deliver the intervention in the field.
To determine the intervention's impact on the costs of healthcare utilization, we will rely on ISPOR's 2014 budgetary impact analysis guidelines. Data on VA-funded utilization costs will be obtained from MCAS) [138] and the Non-VA Medical Care files. We will tabulate all costs from these sources for study enrollees over the period of the study, calculate the difference between intervention and usual care average costs and test for the statistical significance of this difference using the Z-score method proposed by Zhou.
The final step in determining the budgetary impact of the intervention will combine parts 1 and 2 to determine the complete impact of the intervention on the VA budget. While the incremental cost of the

intervention (part 1) will be positive, the impact of the intervention on the costs of VA utilization will likely vary directly with the impact of the intervention on VA utilization.

Research Design and Methods (Aim #5)

Research question #1: **What are the recommendations of non-VA and VA leaders, policy makers, and clinicians for implementing the intervention in other sites?**

An important component of our project is assuring that our research is "consumer-driven" and uses the feedbacks from multiple individuals, including caregivers, Veterans, and stakeholders/partners within the non-VA and VA agencies and programs. To accomplish this we will use traditional strategies and participatory action methods. Participatory action research involves engaging parties in a collaborative effort to examine current practices, problem solve, plan, and monitor processes to affect change. Throughout the project, we will communicate face-to-face with our local stakeholders (staff members at the sites) and via regular telephone conference calls with members in our partner VA Offices and Programs (VA Offices of Nursing Service, VA Office of Geriatrics and Extended Care, VA My Health*e*Vet). These stakeholders and partners will function as advisors and will not be members of the team. We will discuss problems and successes that we are encountering with our stakeholders and partners. We will not share any identifiable information. We will maintain and periodically review notes of our communications and meetings, which will provide valuable feedback concerning refinement, development, and evaluation of our methods for future initiatives.

Research Question #2: **What are the caregivers' perceptions of the value, strengths/weaknesses of the intervention and what facilitators/barriers did they identify with the intervention?**

To obtain feedback from caregivers and to answer this research question, we will conduct in-depth, qualitative interviews with 15 stroke caregivers (5 from each study site).

Sample (size, recruitment, enrollment): We will select a purposive subsample of 15 caregivers who participated in the intervention arm of the study. Sample size considerations in qualitative studies include the purpose/goal of the study and the depth of data needed to reach theoretical saturation and adequately answer the study question. Typically, 8-12 participants are needed to reach theoretical sample. We will select caregivers from each recruitment site following their completion of the intervention. We will telephone the selected caregivers and ask if they are willing to participate in the qualitative interviews. If the caregivers are willing, we will arrange a telephone meeting in which the research assistant will conduct the interviews. We will enroll caregivers from each site until we have the desired sample size.

Data collection: A trained study team member will conduct the in-depth, qualitative interviews over the telephone. The study team member will use an interview guide and will ask caregivers their perceptions of the value, strengths/weaknesses of the intervention, and about the barriers and facilitators in participating in the intervention. The interviews will be digitally recorded, transcribed verbatim by a research team member, and validated by another member of the research team. We will follow traditional qualitative research methods, which recommend that interviews are recorded, transcribed, and then analyzed, rather than using note taking. The recordings will allow the team to conduct more accurate data analysis.

Data analysis: We will use the constant comparative method to analyze the qualitative interviews. Two team members, who are experienced qualitative researchers, will begin by reading the first two caregiver transcripts to identify initial concepts and codes. Then, they will enter data labels and codes into NVivo, a software program that our team has purchased and used in previous projects. NVivo compiles data related to a code, groups related data, and provides a print out of all data for each code to assist further analysis. The two qualitative researchers will regularly interact with the PI to discuss and ultimately arrive at consensus about coding schemes. A final coding framework and codebook will be created. As the interviews are completed, the two qualitative team members will continue their coding and use an iterative, inductive process to generate categories and themes based on identified regularities and repetitive patterns in the data. The qualitative team members will interact regularly with the PI and the entire team to discuss the findings and to search for alternative explanations in the data. Throughout the analysis, the two qualitative team members will write memos in NVivo about data analysis decisions. Common themes with selected, supportive quotations will be presented.

Data Security. To ensure privacy, efforts will be taken to protect the identity of participants and ensure that data are kept confidential. Following data collections procedures, we will de-identify data. Participants will be identified by unique, identifying codes rather than direct identifiers on all written and electronic documents and computer files. While the data may contain some protected health information only a study team member possessing the code can link the data to a particular participant. In the event that the study team needs to contact the participants, they will look up their coded information in his/her local files to track participants' real name and contact information. Electronic files will be stored in folders with restricted access on a protected computer shared drive behind the VA firewall in a secured server. Any hard copies of data forms and coded data will be double-locked in a VHS restricted access location. The data will be only accessible to personnel involved in the study. All staff will be trained to avoid breach of confidentiality issues. We will obtain a data transfer agreement to transport paper data collection the other study sites to the NF/SG VHS via UPS or by having members of the research team personally transport the data using a government-issued or personal vehicle. Data will be secured by using sealed envelopes in a locked container.

In the intervention arm, qualitative interviews between the study team members and the caregivers will be audio-recorded. These interviews will be audio-recorded using PHILLIPSLFH 9600 digital pocket memo w/speech pro recorder. These recorders are VA encrypted (encryption is FIPS 140-2 validated) voice recorders and were recently purchased by the PI for another study. The audio sessions will be downloaded and stored on a protected, secure VA research server, and then deleted from the portable device. Digital recordings will use first names only and any identifying information will be removed once transcribed. All electronic records will be stored on a secure VA server that has limited access to only study personnel and is accessible via desktop workstations that are password protected.

In the intervention arm, the caregivers will participate in the in-home component of the intervention (online skills training and application of problem-solving skills via the RESCUE messaging center). The RESCUE messaging center is an adaptation of the low-ADL Monitoring Program (LAMP) platform that has been used at the North/Florida South Georgia Veterans Healthcare System since 2003. The messaging center is a secure site that is located behind the VA firewall.

7. Possible Discomforts and Risks: Participants may feel tired and uncomfortable or become stressed while discussing stroke-related issues and problems. Caregivers may become tired or have stress during the baseline and post-test data collection sessions. There also is a slight risk that there could be a privacy breach and information about the caregivers in both arms of the study could be revealed inappropriately or accidentally.

8. Possible Benefits: There are no direct benefits from this study. Participants may benefit from learning problem-solving techniques that may help them transition into their role as caregivers more efficiently. Also, participants may benefit from obtaining information and resources on the RESCUE website. Possible future benefits are identification of best practices for improving discharge planning and transitional care for caregivers of Veterans with stroke.

9. Conflict of Interest: There is no conflict of interest for the investigators and/or the participants.