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Pros and Woes of Interdisciplinary Collaboration with a National Clinical Trial

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Abstract

Nursing collaborations with clinical trials provide opportunities to answer important nursing questions, enhance interdisciplinary collaboration, use collected data efficiently, include sophisticated measures, and answer questions that could not be answered by either project alone. To foster interdisciplinary collaboration, a funding initiative from the National Institute of Nursing Research (NINR) was issued to link nurse researchers and clinical trial teams. This paper describes a successful collaboration between EXCITE (Extremity Constraint-Induced Therapy Evaluation), a multi-site, national clinical trial and Caregiver-EXCITE, a complementary nursing study funded by NINR. EXCITE tested a neurorehabilitative technique to improve upper extremity function in stroke survivors, while Caregiver-EXCITE addressed hypotheses about family function, stroke recovery, and caregiver outcomes. This paper addresses advantages and challenges of this collaboration and provides illustrations of excellent opportunities that joint ventures offer to advance science. These types of collaborations have the potential to profoundly move nursing's research agenda forward.

Rehabilitation is considered a very effective method for reducing the morbidity associated with multiple illnesses; yet this process has been described as the "archetypal complex intervention" (Wade, 2005). As with any complex construct, a multidimensional approach is essential to gain the most accurate and complete perspective. The demand for evidence-based practice in health care necessitates effective collaboration among health care professionals in practice, research and educational settings. Nursing research collaborations with clinical trials provide excellent ways to explore important nursing issues, enhance interdisciplinary cooperation, facilitate participant recruitment, use collected data efficiently and maximize use of research resources and infrastructure. Ultimately, this systematic professional cooperation facilitates the potential to address broad-reaching questions that could not be answered in professional isolation.

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To foster the interdisciplinary process, the National Institute of Nursing Research (NINR) released in February of 2000 a request for applications (RFA) titled, "Clinical Trials: Collaboration for Nursing Research." The primary purpose of this visionary RFA was to facilitate linkages between nurse researchers with non nurse researchers conducting clinical trials. The rationale was that time, energy, populations and resources already expended for clinical trials could be maximized by yielding data for an additional study. Additionally, there was an expectation that long-term collaborations between research teams to expand the expertise of each team in future ventures could be developed.

The purpose of this paper is to describe one of the successful proposals from this RFA and some of the advantages that this type of collaboration promotes. This paper also examines some of the challenges encountered by the first author, a new investigator, from preparation of the proposal to implementation of this collaborative experience and the benefits of successful collaborations with planning and implementation of two projects. Papers describing the coordination of collaborative studies are relatively scarce in nursing and rehabilitation literature, often with only cursory discussions of the issue.

Description of the Clinical Trials: Collaboration for Nursing Research RFA

Specific criteria had to be addressed for a successful application of the Clinical Trials: Collaboration for Nursing Research RFA (NR-00-003) issued by the NINR. One requirement was that the nurse researcher collaborate with a non-nurse researcher (or vice versa) who had an ongoing, experimental clinical trial. For the RFA, aspects of the research question posed by the nurse from her/his ongoing program of research could be answered by accessing data collected as part of the clinical trial. Although the application of the nursing study required specific aims that were complementary to the clinical trial, the proposal also had to address separate, valid and salient nursing questions.

The RFA addressed NINR's vision to drive the nursing research agenda forward while fostering dynamic interdisciplinary collaboration. The RFA criteria reflected NINR's specific, multi-purpose rationales for fostering these collaborations. First, the NIH has numerous, ongoing, funded clinical trials in which the collaborative efforts of complementary studies would maximize the time, energy, populations, and resources already being expended for these clinical trials. An effective study pairing would then yield valuable data resources for both projects. This cooperative approach is economical and improves research efficiency. Second, the RFA created opportunities to develop long-term collaborations between research teams to expand the expertise of each team leading to future joint ventures. The study "Family Function, Stroke Recovery, and Caregiver Outcomes" (RO1NR07612-03) will be used to illustrate how these types of collaborations can facilitate nurse researchers.

Impetus for the Clinical Trial and the Complementary Caregiving Study

The nurse researcher (first author) had a beginning program of research that involved the evaluation of family caregivers of adults with chronic illness, with a specific focus on family caregivers of stroke survivors. Prior to the release of the RFA, the nurse researcher had contacted an internationally known researcher in stroke rehabilitation (last author) to discuss potential collaboration opportunities. The senior researcher was principal investigator (PI) for a recently funded national multi-site, experimental, clinical trial on constraint-induced movement therapy (CIMT). The proposal, entitled EXtremity Constraint-Induced Therapy Evaluation (EXCITE), involves teaching stroke patients to regain use of their impaired arm by limiting use of the stronger arm and providing intense training (Aycock, Blanton, Clark, & Wolf, 2004; Winstein et al., 2003; Wolf et al., 2006). Stroke survivors would participate in EXCITE for two years and be randomized to receive CIMT at baseline (3–9 months post-

stroke) or one year later (15–21 months post-stroke) with follow up testing occurring every 4 months (Table 1). Learning more about the EXCITE proposal, the nurse investigator recognized an opportunity to collect data from the family caregivers of EXCITE participants.

Upon the release of the NINR RFA, the EXCITE principal investigator (PI) and the nurse researcher knew their collaboration would “fit like a glove,” and consequently agreed to work together. Several key activities had to be initiated. First, the proposed collaboration with nurse researcher to develop a grant application for the complementary caregiver study was presented to the other EXCITE principal investigators (site PIs) to garner their support. Next a full NINR proposal including subcontracts for each site needed to be developed. Collectively, the EXCITE site PIs and co-investigators recognized the value of addressing not only physical function of stroke survivors, but also the effects on family members as a primary impetus for generating a concerted effort to explore ways of improving quality of life of both after this disabling event.

The complementary caregiver study titled, Family Function, Stroke Recovery, and Caregiver Outcomes, was designed to evaluate how caregivers of stroke survivors are affected by caring for their family member in the sub-acute phase of stroke recovery. Caregiver data would be collected at baseline (3–9 months post-stroke), and at four and eight months, in conjunction with the stroke survivors’ evaluation for EXCITE (Table 2).

The caregiving study enabled a unique and broader evaluation of CIMT by determining not only if any of the family characteristics might influence the caregiver outcomes, but also if the family characteristics might influence the stroke survivor outcomes. At the same time, the team was well positioned to assess the potential influence of the family in facilitating or hindering the CIMT intervention.

The EXCITE trial took place at six rehabilitation facilities associated with U.S. academic institutions. Ultimately, five of these sites agreed to participate in the caregiver study.

Issues in Linking with a Multi-site, National Clinical Trial

Complementary Study Proposal Development

One of the advantages of this project was the extensive expertise and support in proposal development from the EXCITE PI and his colleagues. For example, all the sites had completed substantial work to document the potential numbers of research participants at each site along with the expected ethnic breakdown of potential participants. There were also extensive preliminary data the sites had collected previously while measuring stroke survivor function which was incorporated into the appendices of the caregiver application. Conversely, the EXCITE team also became part of the caregiver team with the EXCITE PI being designated as a co-investigator for the Caregiving study and the other EXCITE investigators as site PIs. All of these investigators were rehabilitation scientists with extensive experience in NIH funded research, with specific expertise in recovery of motor function post stroke.

A unique aspect of the collaboration was the collection of outcome measures that were designed to evaluate potential full-spectrum (body structure/function, activities, and participation) effects of CIMT, following the *International Classification of Functioning, Disability and Health* (ICF) Model of Functioning and Disability (World Health Organization, 2001). The ICF model was initiated by the World Health Organization in 2001 to provide a framework specifically for interdisciplinary research in disability. Consequently, not only the functionally based goals to improve use of the more affected upper extremity would be addressed in this collaboration, but equally important, the broader effect of the intervention on disability, social participation and family functioning would also be considered. Ultimately, the result of this

integration facilitated the translational goal of the ICF model by promoting multidisciplinary responsibility and addressing the broader context of stroke recovery.

The EXCITE team had planned sophisticated measures to assess stroke survivors' motor function. For example the Wolf Motor Function Test (WMFT) (Wolf et al., 2001) is performed in the laboratory and is a series of timed tasks. All therapists administering the test were blinded to participant condition and completed an extensive standardization process across sites prior to initiation of the study. Although evaluator standardization helped to ensure reliability of test administration, this process along with the accompanying videotaping, increased the expense of the study. Since nursing studies often rely on self-report measure of functioning, the addition of the objective and sophisticated WMFT measure strengthened the Caregiving study. Conversely, the EXCITE study did not include measures of the stroke survivors memory and behavior changes post-stroke. The Caregiving study did include an instrument that measured the caregiver's report of these changes (Clark, Dunbar, Aycok, Courtney, & Wolf, 2006). Including this measure allowed evaluation of the role these changes might play in the stroke survivors' response to CIMT.

Typically due to financial restraints, nursing studies often are conducted in one site or a limited geographic region. The ability to plan a multi-site study enhances the potential for generalizability of the findings. EXCITE evaluation sites were all located at major academic medical institutions and primarily based in the "stroke belt" of the southeastern United States, to enhance recruitment potential. Having locations in California and the South also enhanced minority population recruitment possibilities and indeed, these sites had a greater diversity in their participant race and ethnicity (Blanton et al., 2006).

Recruitment Dependency

Inadequate recruitment is one of the principle reasons that many clinical trials fail. One of the primary purposes of the nursing RFA was to enhance collaborative efforts to maximize resources, including recruitment resources. However, while one of the benefits of study collaboration is the shared access to participants, the complementary study recruitment is ultimately dependent upon the success of the larger study's recruitment efforts. Consequently, if overall recruitment is slow, the complementary study will be adversely affected and possibly delayed. One approach to minimize these negative effects is to build into the proposed complementary study budget sufficient support to assist with recruitment at all sites. This effort will enable the primary study to have sufficient funding to adequately support personnel needed to incorporate aggressive recruitment strategies.

Indeed, some of the challenges that were faced during the Caregiver study did result from delayed initiation and recruitment in the EXCITE trial (The reader is referred to Blanton et al. 2006 (Blanton et al., 2006) for a detailed description of EXCITE recruitment efforts). Since participants for the Caregiver study were recruited at the time their family members were enrolled in EXCITE, all data collection aspects of the Caregiver trial were similarly affected. Thus, anticipating potentially costly setbacks and delays is essential whenever collaborating with another primary study and modifications should be in terms of the budget and time allocations. Fortunately, these modifications were made with the Caregiver study, and sufficient funds were available to support the extended timeline. Failure to do such advanced planning may prohibit a complementary study from meeting recruitment goals. Ultimately, EXCITE reached 94 % of its recruitment goal and the caregiving study enrolled 86 % of those caregivers.

In addition to initial accrual in recruitment, attrition of participants is also an important aspect to anticipate in study planning. Of the 18(13%) caregivers who did not complete the study, 11 withdrew due to the stroke survivor dropping out of EXCITE.

Modifications in study protocol

Investigators should be aware that changes occurring in the primary study may directly or indirectly cause changes in the complementary study protocol. For example, due to difficulty with participant recruitment, EXCITE eased the eligibility criteria for enrollment by widening the window of time post stroke from 3–6 months to 3–9 months. Some minor changes in outcome instruments were also made. Consequently, the Caregiver study needed to adjust their measurement protocol as well. Implementing these changes included revising the consent form for all sites, causing additional time and financial expense. In light of the potential for study changes, the principal investigator (PI) of a complementary study should plan routine team meetings and clinical trial conference calls with the primary study investigators to stay abreast of any alterations that may affect the complementary study.

Maintaining communication

As evident by the previous examples, maintaining close communication between a complementary study and the primary study, among sites and investigators, is essential. In our case, communication was facilitated by the PI of the national clinical trial and the PI of the complementary Caregiving study being located at the same site. Not only does the PI of complementary study need to attend regular research meetings to maintain lines of communications, but the PI's of both studies need to have a supportive relationship such that successfully reaching the goals of both studies is a priority. These team meetings can be goal directed, addressing benchmarks that have not been met, brainstorming and facilitating solution-oriented discussions for resolving obstacles and improving team cohesiveness. Certainly, the PI of the primary clinical trial should be considered a strong advocate to the other site PIs when necessary to maintain support for the complementary study. This type of collaborative linking of the interdisciplinary team to create an environment for cultivating knowledge and advancing ideas provides a stimulating and rewarding environment. The Caregiver team participated in weekly EXCITE team meetings with the PI and other EXCITE personnel, initially to discuss the progress of the study and later to promote interdisciplinary discussion through a journal club, which is still active today. Team meetings focused on study conduct and current issues related to the trial while the journal club provided an opportunity to present and discuss new and important findings related to member's interest areas. Additionally, the journal club provided an opportunity to have peer-reviewed discussion of manuscripts being prepared for publication by various members of each team. The Caregiver PI also was invited to EXCITE site team meetings which often were held in conjunction with scientific conferences. This enabled the nurse researcher to learn more about the investigators and their individual programs of research. Moreover, because of the Caregiver PI's consistent involvement, two years into the EXCITE study, she was provided an opportunity to become an active member of the EXCITE investigative team and charged with oversight of the interpretation of behavioral data gathered from EXCITE. Such opportunities, though not as commonplace, enhance communication and linkages between each study.

Data Management Issues

Often the clinical trial has a national data management center that has the primary responsibility of collecting and housing all the data from each site. This method of designating a separate site solely for data management has many benefits, but can also increase the cost of the study substantially. Again, the opportunity to share in data management resources was another objective of the nursing RFA and an important aspect in collaborations. However, while using these services can be quite valuable, the PI of the complementary study should weigh the advantages and disadvantages of managing his or her own data versus relying on the primary studies separate data management center. With the Caregiver study, the nurse investigator's project manager managed the caregiving data to facilitate analysis in a timely manner and the

EXCITE data management center provided stroke survivor data needed for the Caregiver study. Because the national clinical trial investigators used a blinded design and were not permitted to see the data from the follow up time points until their release by the EXCITE Data Safety and Monitoring board, access to the stroke survivor data for the caregiving study was delayed for several months. Due to a longer participation period for EXCITE (2 years for stroke survivors compared to 8 months for caregivers) and blinding of the EXCITE treatment condition; data beyond baseline were not available for analysis until after one year follow up of the EXCITE trial was complete. Thus, the Caregiver study team published their baseline data (Clark et al., 2004) and reaffirmed that their data files were ready for analysis as soon as the EXCITE data were released. Investigators of collaborative studies should anticipate that these delays may affect the timing for dissemination of findings and the availability of preliminary data for future planned grant submissions. However, with the Caregiver study baseline data, the nurse investigator developed a proposal and obtained funding to pilot an intervention program on post-stroke depression while awaiting release of the stroke survivor data. Thus, maintaining control of the caregiver data ultimately was a good decision. Clear guidelines are needed to insure efficient access to clinical trial data from the data management site. A specific data transfer plan that enabled the retrieval of demographics of stroke survivors, their motor function, and quality of life data was devised.

The mismatch of data collection periods caused delay in the analysis of longitudinal data from Caregiver-EXCITE that involved stroke survivor outcomes. While this was a foreseeable issue, the full length of time taken for release of data and obtaining the data files was unanticipated. Researchers need to think carefully about data management when essential data are to be shared.

Dissemination of Knowledge through Publication and Presentation

One of the distinct and unique benefits of study collaboration is the opportunity to coauthor study publications. Interdisciplinary team collaboration, in particular, offers important avenues for sharing expertise from collaborators with complementary disciplines to collectively gain a greater understanding of a study outcome. As such, when multiple investigators are using data from the clinical trial, clear guidelines should be established at the beginning of the study that define the boundaries of who has access to which data for publication. This planning can prevent problems of overlap in data dissemination and misunderstandings that might result in feelings of resentment from investigators. While the Caregiver study publications directly related to the aims of the Caregiver Study, these were independent of the primary clinical trial and its deciding authors; however, on most papers a member of EXCITE has been a co-author. Again, consistent and comprehensive communication is essential in manuscript development to facilitate supportive and cooperative investigator relationships.

This collaboration offered multiple opportunities for junior investigators on both research teams to have the opportunity to be mentored in writing and publishing. Near final manuscripts in progress were frequently presented at journal club to obtain feedback from multiple individuals. Junior investigators had the opportunity to contribute to a paper as a co-author, gain valuable writing and editing experience, and “jump start” their publishing without having to take the lead in a writing group.

The EXCITE clinical trial has written publication guidelines as part of their procedure manual and the nurse investigator also adhered to these guidelines when using primarily EXCITE data. To facilitate the organization of manuscript development among the many individuals involved, the EXCITE PI developed a master list with input of the research team of all potential papers. The lead author was identified on the list with each paper assigned a specific category (e.g. major primary outcome paper, site specific paper, related paper). This list was routinely circulated to all study investigators so they could indicate if they had an interest in contributing

to a specific manuscript. This list also served as a mechanism to monitor the progress of the completion and submission of manuscripts, thus insuring productivity of the team. The planned papers from Caregiver-EXCITE were listed on the master EXCITE list and coded as a separate category. To date there have been 26 papers published with 9 (35%) of those specifically from Caregiver-EXCITE and many more in progress.

By sharing presentations and co-authoring of manuscripts, dissemination of study findings was enhanced across several health care arenas and allowed for multiple perspectives to be expressed among collaborators. Members of the EXCITE team and Caregiver team have given national and international presentations for a multitude of audiences, including nursing, physicians, therapists and stroke survivors.

Only Positives in Advancing Science

Although there are challenges when combining two projects, the benefits of designing a complementary study to a larger clinical trial are substantial. A noted author in the area of the value of teams dispels the “myth of the Lone Ranger” and describes how teams have more depth and can accomplish so much more than individuals (Maxwell, 2001). Certainly in collaborative research studies, the “whole is greater than the sum of its parts.” Building research capacity and the need for partnerships has been recognized by rehabilitation medicine (Frontera et al., 2006).

The nurse investigator who was a novice researcher (approximately two years post PhD when the RO1 was awarded) gained priceless guidance from two senior scientists (Drs. _____ & _____) in grant management and development as a nursing scientist. The value of working closely with senior scientists cannot be overstated. The opportunities to see how they effectively lead teams to address problems that surface during the study, insure the scientific integrity of the research process, make decisions when there are disagreements among the teams, create new opportunities as students or personnel changes in the teams occur, and constantly foster the success of team members are much like an apprenticeship. These mentors incorporated all of the characteristics of a successful mentor (Blixen, Papp, Hull, Rudick, & Bramstedt, 2007). In a recent research report, (Jackson et al., 2003) almost 98% of interviewed faculty members identified lack of mentoring as either the first or second most important factor hindering career progress in academic medicine. While reviewing many of the elements that make mentoring such a complex activity, having the “right chemistry” was one of the most important aspects of this type of professional relationship. In addition having a mentor is associated with more research productivity (Paul, Stein, Ottenbacher, & Liu, 2002; Sambunjak, Straus, & Marusic, 2006).

Multiple unexpected opportunities for students occurred as a result of this interdisciplinary collaboration. Examples of these opportunities are described in Table 3. Students gained valuable skills in interacting with other disciplines, writing in teams, manuscript development, and presentation skills. In addition, there are intangible gains through informal interactions with different scientists and clinicians involved in research.

In collaborating with the EXCITE PI and his colleagues, the Caregiver research team was enhanced with a broad array of expertise. The EXCITE PIs, on the other hand recognized the valuable contribution that obtaining data from family caregivers and examining the interactions of the family characteristics with the EXCITE intervention would provide to implementation of the new neurorehabilitative techniques. These research collaborations continue and new opportunities for research collaboration with other members of EXCITE have developed.

New interests and ideas can stem from collaborative efforts into new programs of research. For example, further research has evolved from the Caregiver study finding that not only is

post-stroke depression under-recognized and under-treated, but just as important, caregivers may not identify symptoms of depression in their family member or themselves. As a result, additional funding was received from the Emory Center for the Study of Symptoms, Symptom Interactions, and Health Outcomes to pilot a study testing an online depression education and evaluation program for stroke caregivers. Another funded project from EXCITE explored brain plasticity resulting from CIMT with the use of neuroimaging techniques such as functional MRI and Transcranial Magnetic Stimulation (TMS) to examine motor control and cerebral activity changes (Alberts, Butler, & Wolf, 2004; Wolf, Butler, Alberts, & Kim, 2005).

These examples demonstrate the ripple effect that the merging of two key projects with a common focus can have in fostering interdisciplinary research and motivating researchers, students, and clinicians.

Conclusion

In many ways the purposes of the NINR RFA: *Clinical Trials: Collaboration for Nursing Research* were consistent with the NIH Roadmap which has as a primary goal of fostering translational research by linking interdisciplinary researchers with a common goal (National Institutes of Health). The multiple projects that were associated with EXCITE brought this type of interdisciplinary focus on the important problem of improving stroke rehabilitation.

The NINR RFA invited investigators to participate in an initiative that capitalized on the substantial resources of available study populations in clinical trials from the unique perspective of nursing research and special expertise of nurse researchers. The purpose of this RFA - to link supplemental studies posed by nurse researchers to currently funded clinical research studies - achieved the initial goal of promoting the cross-fertilization of ideas through interdisciplinary collaborations. This initiative also provided a cost effective way to stimulate ongoing nursing research while capitalizing on resources allocated for a primary clinical trial. The study "Family Function, Stroke Recovery, and Caregiver Outcomes" was a successful example of collaboration with a parent study, The EXCITE national clinical trial, on a multitude of levels. These include: guidance in proposal development for a new nursing researcher, active participation of the nursing researcher in the clinical trial, effective and efficient participant recruitment, supportive and consistent investigator communication, management of complex data analysis with an ICF model approach to outcome measurement, dissemination of knowledge across multidisciplinary fields, development of undergraduate and graduate student nursing learning opportunities and fostering of future collaborative efforts among investigators. With proper advanced planning and supportive collegial networks, interdisciplinary collaborations can be a vital piece of promoting evidence-based practice in nursing.

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Table 1
National Clinical Trial

EXCITE – Extremity Constraint-Induced Therapy Evaluation

Background: With the emergence of science for cortical reorganization following stroke, new rehabilitation techniques based on the idea of reorganization offer promise for better outcomes. One such technique is constraint induced movement therapy (CIMT) that involves teaching a stroke patient to regain use of his or her impaired arm by limiting use of the stronger arm and undergoing intense, structured, task-specific training.

Purpose: To devise a multi-site randomized controlled trial to determine if CIMT can be applied 3–9 months after stroke and evaluate long-term gains and responsiveness to CIT depending on initial level of motor ability and time of treatment, before 9 months or after one year. **Methods:** Stroke survivors 3–9 months post onset from an initial first time clinical cerebrovascular accident (ischemic or hemorrhagic), meeting specific active range of motion criteria for wrist movement, and scoring ≥ 24 Mini Mental State exam were enrolled at six different rehabilitation sites in the United States. Participants were randomized to one of two groups, the immediate group that received the therapy in the sub-acute period, 3–9 months post-stroke or the delayed group that served as the control group receiving normal and usual care in the sub-acute phase and the therapy one year later (15–21 months post-stroke). The intervention involved wearing a protective safety mitt on the less affected hand 90% of waking hours for 14 consecutive days and receiving training that involved practicing functional task activities using both repetitive task practice and shaping for up to 6 hours a day for 10 of the 14 restraint days.

Measurements: Data were collected for all participants at baseline, and months 4, 8, 12, 16, 20, and 24. Measurements included upper extremity motor function (Wolf Motor Function Test), varying measures for real world arm use (Motor Activity Log, Actual Amount of Use Test and Accelerometry), quality of life (Stroke Impact Scale), a physical exam and compliance for wearing the mitt. **Significance:** The results of the study, the first multi-site single-blind randomized control trial of CIT in subacute stroke, will be a foundation for future research and rehabilitation.

Table 2
Complementary Nursing Study

Family Function, Stroke Recovery and Caregivers Outcomes

Background: Family caregivers experience negative outcomes from caring for a stroke survivor. The detrimental physical and emotional affects that occur may result in inadequate care for the survivor. **Purpose:** The purposes of the study were (1) to determine relationships among family caregiver outcomes (depression, fatigue and overall health), family functioning, and stroke survivor physical function and memory/behavior changes over time, (2) determine predictors of caregiver outcomes approximately one year post-stroke, and (3) examine the interaction of family function and the EXCITE treatment group on stroke survivor functional recovery. **Methods:** Self-identified caregivers of stroke survivors participating in the EXCITE clinical trial for Constraint-induced therapy that were 18 years of age or older; able to read and speak English and not currently under treatment for depression were enrolled at the EXCITE participants baseline visit, 3–9 months post-stroke. Caregiver data were collected at baseline (3–9 months post-stroke), and four and eight months later through administration of questionnaires and semi-structured interview. **Measurements:** Caregivers were asked about their health (SF36V2), feelings (CES-D), fatigue (Piper Fatigue Scale), family function (Family Assessment Device, Family Caregiver Conflict Scale, Perceived Criticism Scale) memory and behavior changes of the stroke survivor and use of community resources for the stroke survivor.

Significance: Data will provide a unique opportunity to assess the interaction between family functioning and an innovative neurorehabilitation technique for recovery of stroke survivor physical function. This information will facilitate understanding of family function changes during the recovery period and explore how stroke survivor characteristics and family function interact to affect both caregiver outcomes and stroke survivor recovery. The long-term goal of the program of research is to develop and test family-based interventions to improve caregiver outcomes and positively affect stroke survivor recovery.

Table 3

Examples of Opportunities for Students/Clinicians Emerging from Collaboration with a Clinical Trial

Opportunity	Outcome
Undergraduate nursing research honors student assisted with analysis of EXCITE trial data regarding pain and fatigue during CIMT	<ul style="list-style-type: none"> Presented a poster at a regional research conference. First author on a publication (Underwood, Clark, Blanton, Aycock, & Wolf, 2006)
Undergraduate nursing research honors student assisted with analysis and interpretation of Caregiver data regarding gender differences in caregiver outcomes	<ul style="list-style-type: none"> Presented a poster at a regional research conference.
Neurobehavioral science student and research assistant for EXCITE developed an interest in family caregiving through interacting with caregiving study staff at journal club	<ul style="list-style-type: none"> Gained skills in data analysis and publishing First author on a publication comparing working and non-working caregivers using caregiving data with co-authors from the Caregiver study (Ko, Aycock, & Clark, 2007)
Masters student in nursing and member of Caregiver study team	<ul style="list-style-type: none"> Led journal club First author on publication (Aycock et al., 2004)
Doctoral student in nursing completed a clinical residency in the EXCITE lab and participated in journal club.	<ul style="list-style-type: none"> Evaluated stroke survivor fMRI data and developed process for checking reliability of readings Led journal club Further developed research ideas about congruency of stroke survivors and caregivers on stroke survivor depressive symptoms and received a national Research Service Award in this area Presented abstracts at the International Stroke Conference and American Heart Association Scientific Sessions First author on a manuscript (Klinedinst, Clark, Blanton, & Wolf, in press) and another one near completion.
Doctoral student in nursing gained research experience	<ul style="list-style-type: none"> Developed database management skills and analysis on sub-sample from one site on stroke survivors' depression and fatigue
Occupational therapist on EXCITE with interest in qualitative research	<ul style="list-style-type: none"> Conducted qualitative case study with EXCITE participant after being linked with a qualitative nursing researcher, who was colleague of Caregiver PI.